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ABSTRACT

This document identifies student learning outcomes for kindergarten to grade 4 mathematics and standards of performance for students who are completing grade 3. The document is organized into three parts: overview, student learning outcomes, and standards of student performance. The overview describes the beliefs, goals, and conceptual structure of mathematics instruction and provides the context for the use of student learning outcomes and standards of student performance. The student learning outcomes section provides concise descriptions of the knowledge and skills that K-4 students are expected to learn in mathematics. Outcomes are expressed as general outcomes and specific outcomes. The final section, standards for student performance, provides descriptions of three levels of student performance in relation to general and specific mathematics outcomes for grade 3. It also contains student samples that illustrate the three different levels of performance for several assessment activities chosen to represent outcomes in each strand of mathematics. (MKR)

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K - 4
Mathematics

Manitoba Curriculum Framework of Outcomes and Grade 3 Standards

Renewing Education:
New Directions

Manitoba
Education
and Training
Linda G. McIntosh,
Minister

S6058396

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K - 4 MATHEMATICS

Manitoba Curriculum
Framework of Outcomes
and Grade 3 Standards

1995

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All illustrative samples of student work found in this document have been selected from work done by Manitoba Grade 3 students. They have not been modified or changed in any way.

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K-4 MATHEMATICS
MANITOBA CURRICULUM FRAMEWORK OF OUTCOMES AND GRADE 3 STANDARDS

I. INTRODUCTION

BACKGROUND

This document identifies student learning outcomes for Kindergarten to Grade 4 mathematics, and standards of performance for students who are completing Grade 3.

This document evolves from three previous events.

- First, Manitoba Education and Training released a policy document called ***Renewing Education: NEW DIRECTIONS—A Blueprint for Action*** (1994). This document outlines several directions for educational renewal in Manitoba. One of these directions, EDUCATIONAL STANDARDS AND EVALUATION, calls for setting educational standards and policies related to student achievement. It states that

  > Standards of student achievement will be developed in relation to what students need to know and be able to do at the end of Grade 3, Grade 6, Senior 1 (Grade 9), and Senior 4 (Grade 12) (p. 17).

- Second, a protocol, signed by the Ministers of Education in Manitoba, Saskatchewan, Alberta, British Columbia, Yukon, and Northwest Territories, led to the creation of ***The Common Curriculum Framework for K-12 Mathematics (1995)***. This document, henceforth called the ***Western Framework***, provides a common base for the curriculum expectations within each Western province and territory and is reflected herein. The current Manitoba mathematics implementation curriculum document for K-4 will be aligned during the 1995-96 school year with the general and specific learning outcomes stated in this Manitoba framework.

- Third, Manitoba Education and Training released a policy document called ***Renewing Education: New Directions—A Foundation for Excellence*** (1995). This document is the basis for all other curriculum documents in Manitoba, including a curriculum framework of outcomes and standards (p.13).

  This is the first such document.

PURPOSE

A curriculum framework is a subject-specific document which identifies outcomes and standards for what students are expected to know and be able to do related to the knowledge and skills of a particular subject area. Curriculum frameworks provide the basis for teaching, learning, and assessing in a particular subject area or course.

A curriculum framework also provides a foundation for further curriculum development and implementation in areas such as student assessment, staff development, and learning resources. Each subject-specific curriculum framework includes an overview, student learning outcomes for each grade from Kindergarten to Senior 4, and, for compulsory core subject areas, standards for student performance at Grade 3 and Grade 6, Senior 1, and Senior 4 (***A Foundation For Excellence*** p. 13).

This mathematics framework document provides the K-4 (Early Years) portion of the outcomes and standards described above. It is organized into three parts

- Overview—describes the beliefs, goals, and conceptual structure of mathematics instruction and provides the context for the use of student learning outcomes and standards of student performance.

- Student Learning Outcomes—provides concise descriptions of the knowledge and skills that K-4 students are expected to learn in mathematics. Outcomes are expressed as general outcomes and specific outcomes.

- Standards of Student Performance—provides descriptions of three levels of student performance in relation to general and specific mathematics outcomes for Grade 3. It also contains student samples which illustrate the three different levels of performance for several assessment activities chosen to represent outcomes in each strand of mathematics.

II. OVERVIEW

RATIONALE

Mathematics is a common human activity, increasing in importance in a technologically-dependent society. A greater proficiency in using mathematics increases the opportunities available to individuals. In striving for self-fulfillment, students need to become mathematically literate in order to explore problem-solving situations, accommodate changing conditions, and actively create new knowledge.

This mathematics framework document responds to these needs. It is designed to support and promote an understanding that

- Mathematics is part of daily life—a way of learning about the world—and we need to appreciate its usefulness.

- Mathematics is both quantitative and geometric in nature, and both bodies of knowledge are of equal importance to the development of mathematical literacy.

- Mathematics and its study supports development of creative and logical thinking, problem-solving, data managing and co-operating skills—necessary skills for both today and tomorrow.

BELIEFS ABOUT STUDENTS AND MATHEMATICS LEARNING

Students are curious, active learners who have individual interests, abilities, and needs. They come to classrooms with different knowledge, life experiences, and backgrounds that generate a range of attitudes about mathematics and life.

Students learn by attaching meaning to what they do. Schooling must, in part, be about enabling students to construct their own meaning of mathematics. This meaning-making process is best supported when learners encounter mathematical experiences that proceed from the simple to the complex and from the concrete to the abstract.

The use of manipulatives can address the diversity of learning styles and developmental stages of students and can enhance the formation of sound, transferable, mathematical concepts. At all levels, students benefit from working with appropriate materials, tools, and contexts when constructing personal meaning about new mathematical ideas.

The learning environment should value and respect each student's way of thinking, so that the learner feels comfortable in taking intellectual risks, asking questions, and posing conjectures.

Adapted from ***The Western Framework***, 1995 (p. 2)

GOALS FOR STUDENTS

The main goals of mathematics education are to prepare students to

- use mathematics confidently to solve problems
- communicate and reason mathematically
- appreciate and value mathematics
- commit themselves to lifelong learning
- become mathematically literate adults, using mathematics to contribute to society.

At the completion of a program, students should have developed a positive attitude toward mathematics and have a base of knowledge and skills related to Patterns and Relations, Statistics and Probability, Shape and Space, and Number.

By experiencing the power and usefulness of mathematics, students develop a positive attitude toward mathematics and can become confident in their ability to undertake the problems of a changing world. Students also should gain an understanding and appreciation of the contributions of mathematics, as a science and as an art, to civilization and to culture.

Students should

- exhibit a positive attitude toward mathematics
- engage and persevere in mathematical tasks and projects
- contribute to mathematical discussions
- take risks in performing mathematical tasks
- exhibit curiosity
- show some enjoyment of mathematical experiences.

All students should receive a level of mathematics education appropriate to their needs and abilities. Mathematics programs sometimes must be modified to support student learning and to help each student, whether less able or highly able, to achieve high expectations and to realize his or her potential.

Adapted from ***The Western Framework***, 1995 (p. 2).

STRUCTURE OF MATHEMATICS

Students of mathematics, regardless of age or experience, are challenged to do mathematics in settings that are new to them. The structure of mathematics, outlined in this section, presents a multifaceted view of mathematics and presents the discipline as concepts, skills, and procedures woven together.

The chart below shows how student outcomes, organized by grade and strand, are designed to be influenced by both Mathematical Processes and the Nature of Mathematics.

figure 1

STRAND \ GRADE	K	1	2	3	4	5	6	7	8	S1	S2	S3	S4
Patterns and Relations • Patterns • Variables and Equations • Relations and Functions **Statistics and Probability** • Data Analysis • Chance and Uncertainty **Shape and Space** • Measurement • 3-D Objects and 2-D Shapes • Transformations **Number** • Number Concepts • Number Operations	**GENERAL OUTCOMES, SPECIFIC OUTCOMES AND ILLUSTRATIVE EXAMPLES to Outline Knowledge, Skills, and Attitudes about Mathematics**												

NATURE OF MATHEMATICS

Change, Constancy, Dimension (size and scale), Number, Pattern, Quantity, Relationships, Shape, Uncertainty

MATHEMATICAL PROCESSES—PROBLEM-SOLVING, COMMUNICATING, ESTIMATING AND USING MENTAL MATHEMATICS, MAKING CONNECTIONS, REASONING, USING TECHNOLOGY, VISUALIZING

Adapted from ***The Western Framework***, 1995 (p. 4).

MATHEMATICAL PROCESSES/BIG IDEAS

There are critical processes that students must encounter and practise in a mathematics program in order to achieve the goals of mathematics education and to support lifelong learning in mathematics. Students are expected to

- relate and apply new mathematical knowledge through problem-solving
- communicate mathematically
- use estimation and mental mathematics where appropriate
- connect mathematical ideas to other concepts in mathematics, to everyday experiences, and to other disciplines
- reason and justify their thinking
- select and use appropriate technologies as tools to solve problems
- use visualization to assist in processing information, making connections, and solving problems.

The structure of mathematics incorporates these seven interrelated mathematical processes that are intended to permeate teaching, learning, and assessing. Each process/big idea is briefly described on the following pages, and each is accompanied by one or more student samples from Manitoba Grade 3 students.

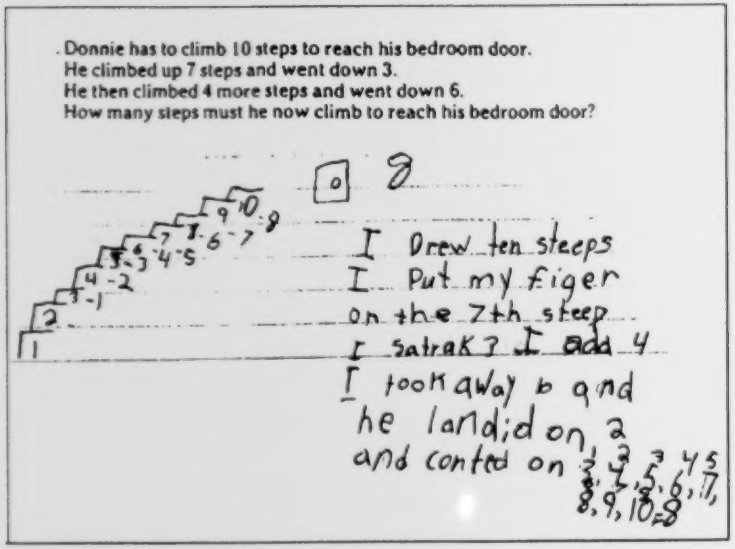
Adapted from ***The Western Framework***, 1995 (p. 5).

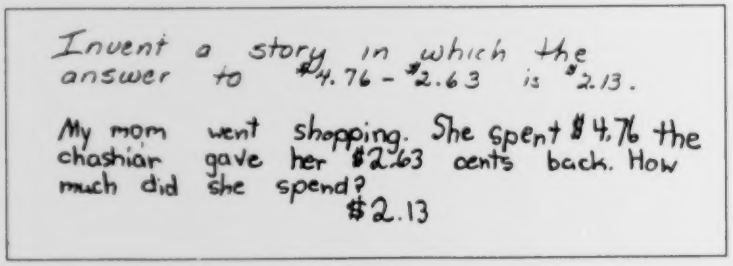
Problem-Solving

Problem-solving is considered the central focus of a curriculum that constructs understanding of mathematical concepts and skills. Problem-solving is an integral part of all mathematical activity. Good instruction seeks to develop mathematical content knowledge and skills through the process of solving problems, as well as to focus attention on the development of approaches and strategies which improve the process of problem-solving.

Problem-solving should be interwoven throughout the strands in order to provide students with a consistent context for learning and applying mathematics. Problem-solving is far more than the narrow "word problem" of the past. Instead, problem-solving requires students to investigate questions, tasks, and situations that introduce and apply mathematical ideas. Students, along with the teacher, choose, apply, and evaluate the effectiveness and efficiency of various problem-solving strategies and procedures. Over time, students develop mathematical and problem-solving power.

Effective problem-solving in the mathematics classroom requires a working climate conducive to exploration, investigation, creation, and communication. Students also must see the relevance of their learning to everyday life, and be given opportunities to use technology to conduct investigations and to find solutions.

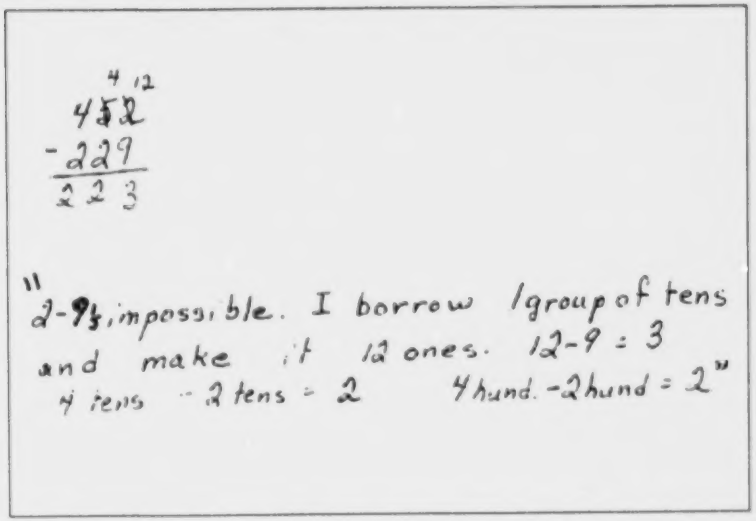

Donnie has to climb 10 steps to reach his bedroom door.
He climbed up 7 steps and went down 3.
He then climbed 4 more steps and went down 6.
How many steps must he now climb to reach his bedroom door?
I Drew ten steeps
I Put my figer
on the 7th steep
I satrak 3 I add 4
I took away 6 and
he landid on 2
and conted on 3,4,5,6,7,
8,9,10=8

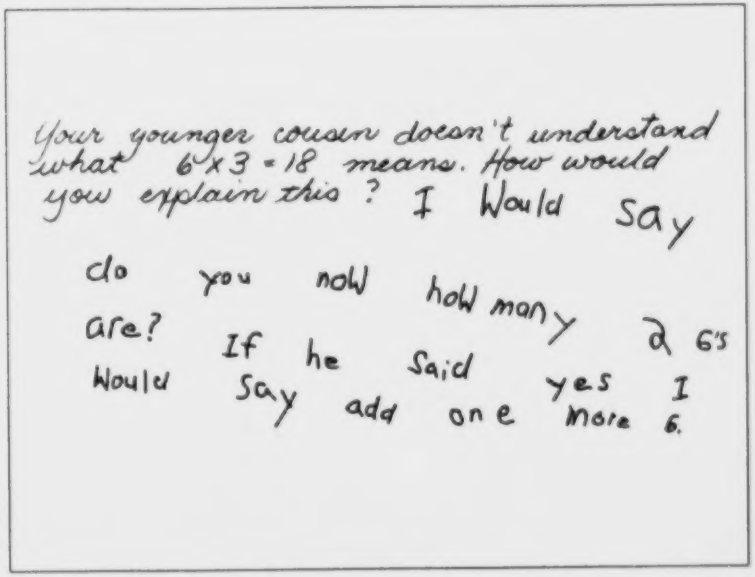

Invent a story in which the answer to $4.76 - $2.63 is $2.13.
My mom went shopping. She spent $4.76 the chashiar gave her $2.63 cents back. How much did she spend?
$2.13

Communicating

The language of mathematics must be made meaningful to students if they are to interpret and communicate mathematical ideas effectively. Mathematical language has its base in everyday language. Daily language is the bridge that enables students to gather information, and to connect informal, intuitive notions to the abstract language and symbols of mathematics.

"Talking mathematics" is a critical step in the construction of mathematical knowledge. Students need numerous opportunities to interact with their teacher and their peers using oral, concrete, pictorial, and symbolic communication. These opportunities help students to think about ideas in a variety of ways, and to clarify their thinking. Explaining how to arrive at a particular solution helps students develop a deeper understanding of the mathematics involved. Experiencing different ways of representing problems and justifying solutions helps them believe that mathematical ideas and processes can legitimately be portrayed at various levels of sophistication. Thus, all students can communicate their present understanding. Students begin to understand the power, flexibility, and usefulness of mathematics both as a language and as a problem-solving tool.




Your younger cousin doesn't understand what 6 x 3 = 18 means. How would you explain this? I Would say
do you now how many are? If he said yes I Would say add one more 6.

Estimating and Using Mental Mathematics

Estimating and using mental mathematics are important life-skills. Our reliance on technology has made it necessary to increase the emphasis on the development of these skills. Students need to know when and how to estimate. The context of a problem helps a student decide whether an exact answer or an estimate of the answer is most appropriate. Students must have opportunities to learn and to practice a variety of estimation strategies so they can arrive at quick approximations for answers.

Mental mathematics is the cornerstone of computational estimation. Students must understand, and commit to memory, the basic facts for the four arithmetic operations. They must understand and be capable of using multiples of 10, 100, and 1000 to calculate solutions to computational questions mentally. They need to develop their own mental arithmetic strategies, but they should also be taught other methods of performing mental calculations.

Five cages each have 4 monkeys and 5 gorillas in them.
How many animals are there altogether? 45

Explain how you got your answer.

First I round 9 to ten and counted by tens to 50 took away Five and came out with 45.

9X5 = 45

I would explain this question by:

- you could draw three circles and put 5 stars in the 9 circles and count all the stars
- you could do 5+5+5+5+5+5+5+5+5 = 45
- you could do (4x5)+(5x5) = 45
- you could have 5 blocks and pile 9 more bats on top until there are 45
- you could do (3x5)+(3x5)+(3x5) = 45
- you could use tooth picks and show them avenues and streets.

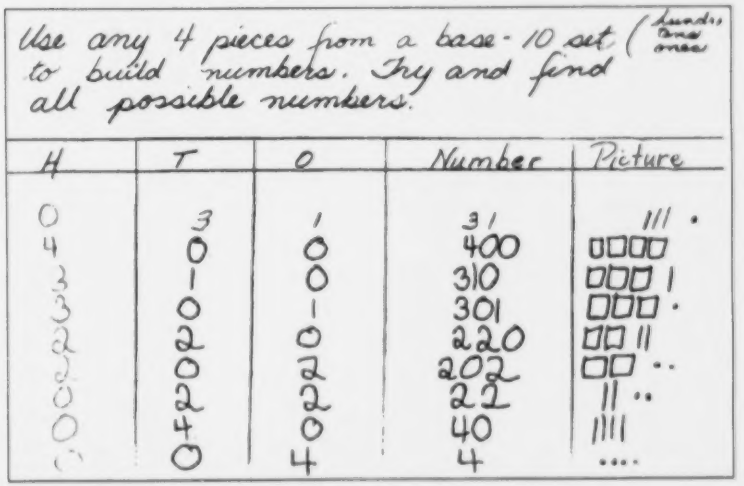
Making Connections

Students need to see how mathematical ideas are related to one another, to other subject areas, and to everyday life. The mathematics curriculum should not be viewed as made up of discrete strands—such as geometry or number—that can be meaningfully taught in isolation from one another. Planning for instruction must involve making choices about activities and contexts which help students make connections within, among, and beyond the strands in mathematics.

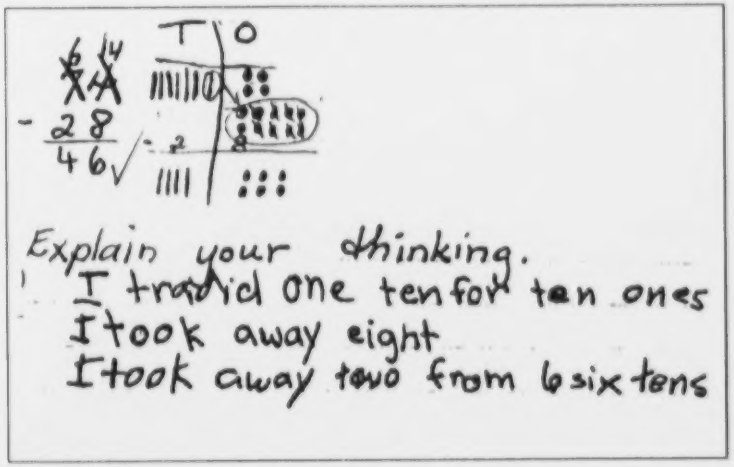
Students benefit from numerous opportunities and experiences designed to help them make connections among various modes of representing mathematical concepts and procedures. They learn that language, pictures, and symbols effectively portray real information. Students who forge connections among various modes of representation have several effective ways to convey their thinking and understanding.

Students need to make connections between and among mathematical ideas in different strands. For example, students should see the relationship between multiplication and rectangular arrays. These types of connections are forged when students are given ongoing opportunities to investigate, discuss, and generalize their ideas.

Students also need to understand how they can use mathematics to learn concepts in other subjects. Teachers should plan experiences and instruction so that cross-curricular connections are revealed and applied. There should be opportunities to explore practical mathematical applications in the school, home, and community. These applications help students understand that mathematics is a powerful and flexible tool that they can use to solve problems, to describe and model real-world phenomena, and to communicate complex thoughts and information.


Use any 4 pieces from a base-10 set (hundreds, tens, ones) to build numbers. Try and find all possible numbers.

H	T	O	Number	Picture
0	3	1	31	||| •
4	0	0	400	□□□□
3	1	0	310	□□□ |
3	0	1	301	□□□ •
2	2	0	220	□□ ||
2	0	2	202	□□ ••
0	2	2	22	|| ••
0	4	0	40	||||
0	0	4	4	••••

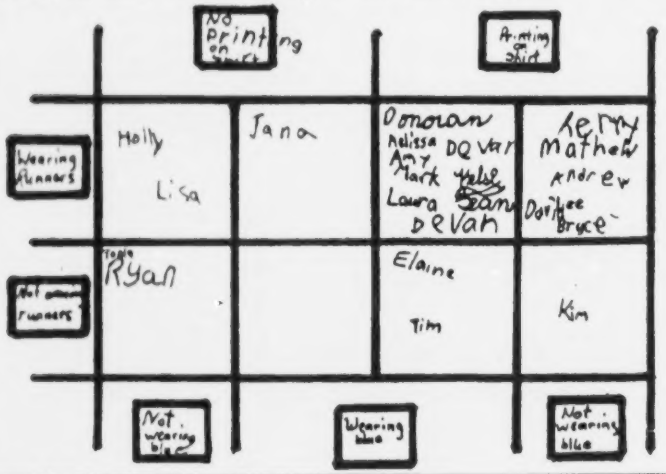


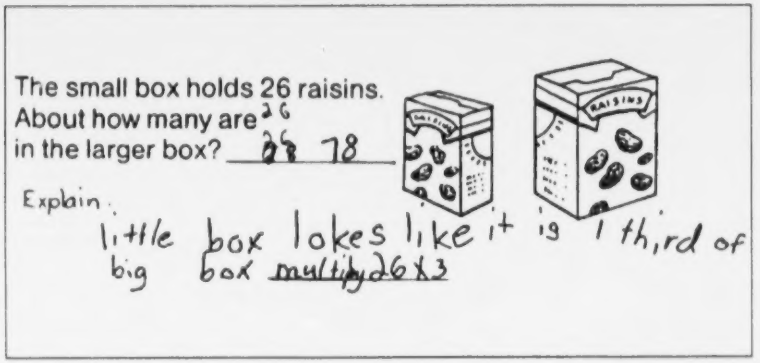
Reasoning

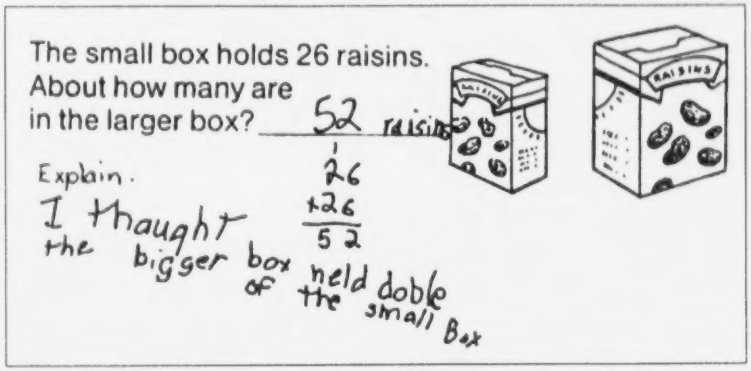
Reasoning is fundamental to knowing and doing mathematics. Students must come to believe that mathematics makes sense; that it is not just a set of rules and procedures to be memorized. They need numerous opportunities to be involved, and to hear their peers involved, in explaining, justifying, and refining their thinking. They need to apply various reasoning processes and to draw logical conclusions.

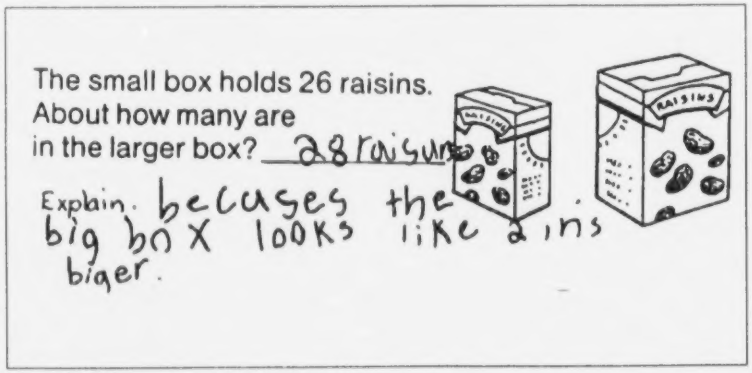
Facilitating student growth in the ability to reason and to generalize is best accomplished by fostering appropriate experiences and reflection. Having students construct, illustrate, write, and present their ideas, conceptualizations, and conclusions is vital to the development of mathematical reasoning skills. Developing reasoning abilities in mathematics can help students build the confidence to justify their thinking in other subject areas.

Print your name where it belongs on this Carroll diagram.




The small box holds 26 raisins.
About how many are in the larger box? 78
Explain.
little box lokes like it is 1 third of big box multiply 26 x 3


The small box holds 26 raisins.
About how many are in the larger box? 52 raisins
Explain.
I thaught the bigger box of the held doble small Box
26
+26
52


The small box holds 26 raisins.
About how many are in the larger box? 28 raisins
Explain. becuses the big box looks like 2 ins biger.

Using Technology

Teachers and students need access to appropriate technology. Using a variety of tools enhances the opportunities for, and the likelihood of, students developing a deeper understanding of mathematical ideas and procedures.

All students need access to calculators with simple functions that help them perform the task of solving real-world problems involving arithmetic operations. In addition, every mathematics classroom needs access to at least one computer for teacher presentation and for student use. Additional computers, probably in a computer lab, but ideally in each classroom, should be available for small-group and whole-class investigation, application, and practice. Software programs providing data bases, spreadsheets, and geometric drawing programs are critical to the successful achievement of the student learning outcomes found in the curriculum. Computer programs which monitor computer-assisted instruction, or provide motivating ways for students to practice operation facts, estimation and mental calculation skills, and spatial problem-solving also are important tools which support a modern mathematics curriculum.

The teacher who values and encourages the use of today's technology will find that most students are keen to participate in a higher level of mathematical thinking and problem-solving than is possible when technology is unavailable.

Enter |+||9| in the calculator and begin pressing |=||=|. . . Record all your numbers in a table. What did you notice first? Find at least one interesting pattern and explore it. See if your pattern continues into three digits. Can you explain why the pattern works? What else did you notice?

The ones go down
9 8 7 6 5 4 3 2 1 0
The tens go
1 2 3 4 5 6 7 8 9

1	9
2	18
3	27
4	36
5	45
6	54
7	63
8	72
9	81
10	90

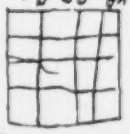
Direct the Logo turtle to draw a shape. Record your directions.

90 + 90 = 180 ; 3 × 15 = 45

FD 30 Rt 90 FD 30 Rt 90
FD 30 Rt 90 FD 30
This is the square

BK 15 Rt 90 FD 30 BK 15
LT 90 FD 15 Rt 180 FD 30
This is a four pain window

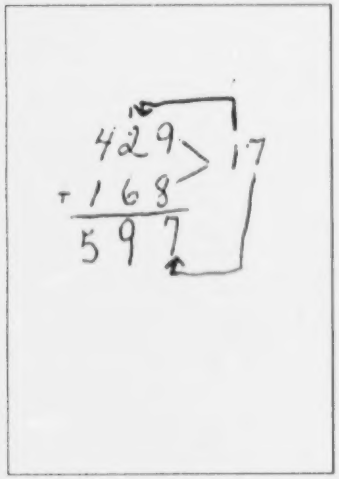
Lt 90 FD 45 Lt 90 FD 30 Lt 90
FD 30 Lt 90 FD 60 Lt 90
FD 30 Lt 90 FD 30 Lt 90 FD 60
Lt 90 FD 30 Lt 90 FD 30 FD 15
LT 90 FD 60 Rt 90 FD 15 Rt 90
FD 15 Rt 90 FD 60 Lt 90 FD 30
Lt 90 FD 90 BK 45 Rt 90 FD 30

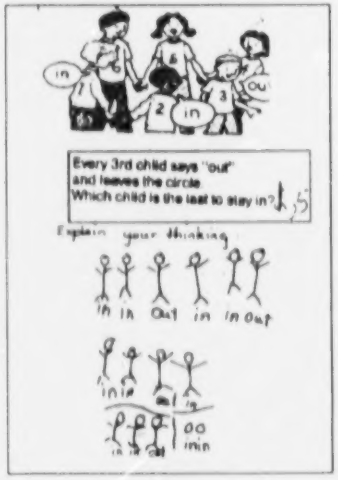


16 pane window

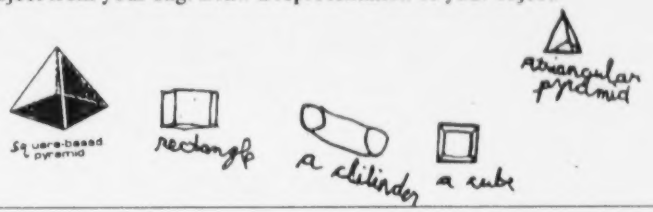
Visualizing

Mathematical visualization refers to the use of mental images which support the development of conceptual and procedural understanding. Some of these images match real-world phenomena or the concrete manipulatives used during classroom instruction. Other images are less concrete and reveal connections or relationships among ideas, available information, mathematical processes, and so on. The latter images may involve the use of standardized graphic organizers such as Venn diagrams or place-value charts. However, students should be encouraged to create diagrams, using simple shapes, lines, and labels, to support their own interpretation of mathematical relationships and connections. Student explanation of personal pictures and images helps forge a deeper understanding of the mathematics involved. Both images and explanations help the teacher and other students to a clearer understanding of the mathematical ideas.

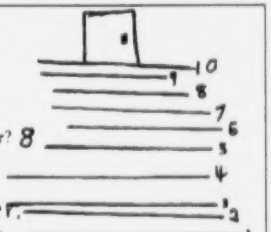




This is a representation of a square-based pyramid. Choose a different object from your bag. Draw a representation of your object.

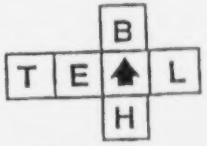


Donnie has to climb 10 steps to reach his bedroom door.
He climbed up 7 steps and went down 3.
He then climbed 4 more steps and went down 6.
How many steps must he now climb to reach his bedroom door? 8

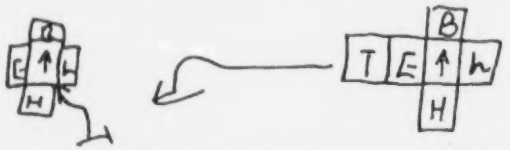


Show how you found the answer.
on the stairs I went up 7 went down three climed 4 more steps and went down 6

Look at the net of the cube.



What letter will be opposite the arrow on the cube? T
Tell how you know. Because t.e.l is one beside the other and all the rest are alone



STRANDS OF MATHEMATICS

The concepts, skills, and procedures of mathematics are connected. However, for purposes of communicating specific information to educators and others, it becomes necessary to use strands or units. A strand includes the concepts, skills, and procedures related to a given topic within the mathematics curriculum.

The mathematics curriculum has been re-organized into four strands, each having one or more sub-strands. (See figure 1 on page 6 and figure 3 on page 57.)

They are

- Patterns and Relations
  - — patterns
  - — variables and equations
  - — relations and functions
- Statistics and Probability
  - — data analysis
  - — chance and uncertainty
- Shape and Space
  - — measurement
  - — 3-D objects and 2-D shapes
  - — transformations
- Number
  - — number concepts
  - — number operations

Problem-solving, discussed previously in this document as a mathematical process/big idea, has not been listed as a strand. However, problem-solving must also be a focus of instruction; i.e., problem-solving instruction must be woven throughout the mathematics curriculum.

A brief description of the components of problem-solving instruction, and a general description of each mathematics strand, follows.

Problem-Solving

All students can benefit from instruction which focuses on the processes, steps, and strategies that successful problem-solvers tend to use.

Early Years teachers can support the curiosity of young students from K to Grade 4 by providing them with experiences that support the following processes

- exploring
- inquiring
- predicting possibilities
- planning and collecting
- deciding
- communicating
- evaluating

By Grade 3, students can be helped to use the basic problem-solving steps

- understand the problem
- make a plan
- carry out your plan
- look back
- communicate your solution(s)

During the Early Years, students also benefit from instruction that supports their use of various strategies which help them to get started when they don't readily see how to begin. Possible problem-solving strategies include

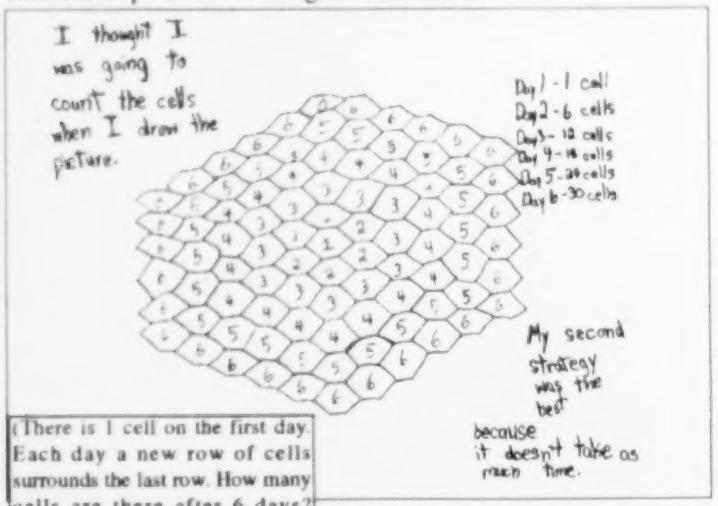
- look for and use a pattern
- act out or build a model of the situation
- draw a picture, a diagram, or a graph to illustrate the information
- make an organized list, a table, or a chart
- estimate or guess; then check
- use smaller numbers, or simplify the problem in other ways
- work backwards

Problem-solving should be both a process for learning more about mathematics and a focus that permeates the experiences and instruction in all strands.

Patterns and Relationships

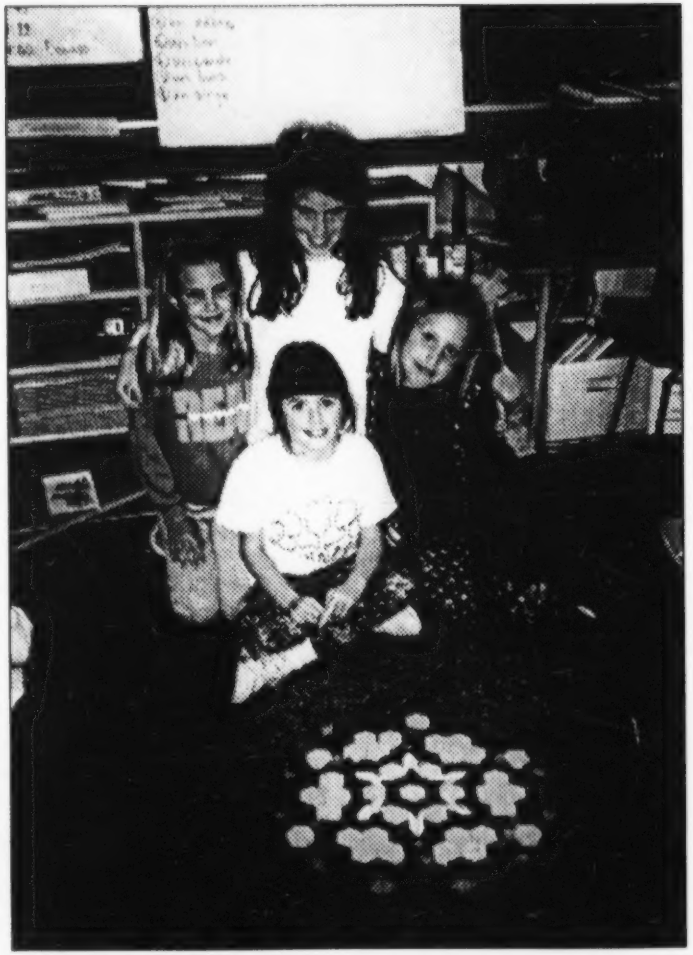
Mathematics is the study of patterns and relationships. Each strand in mathematics should be developed with the view that students who recognize, explore, and use inherent patterns will find the concepts and procedures easier to understand, and will be able to connect them to other ideas and procedures within and outside mathematics.

It is important that students use real-world phenomena, mathematical materials, calculators, and computer software to support their ongoing discovery and explorations of patterns. These tools make it possible for all students to construct many types of repeating and growing patterns. Calculators and computer software make it possible for students to find and study patterns that are not available unless they have access to these tools. Through them, students deepen their understanding, and are better able to recognize mathematical relationships and to form generalizations.


I thought I was going to count the cells when I drew the picture.
Day 1 - 1 cell
Day 2 - 6 cells
Day 3 - 12 cells
Day 4 - 18 cells
Day 5 - 24 cells
Day 6 - 30 cells
My second strategy was the best because it doesn't take as much time.

(There is 1 cell on the first day. Each day a new row of cells surrounds the last row. How many cells are there after 6 days? Explain your counting strategies.)

50



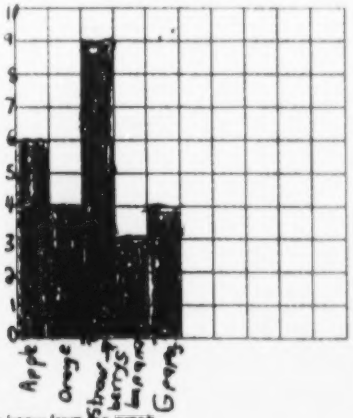
51

Statistics and Probability

This strand focuses on data analysis and chance. Early instructional activities involve students in posing questions about populations, phenomena, or events; and collecting, organizing, displaying, and interpreting first and second-hand data in order to make predictions. Students learn, over time, to choose appropriate methods for gathering, organizing, and displaying data. They also learn to construct and conduct experiments to obtain data for better determining the probability of events. By learning these skills, children are better able to interpret real-world information and make informed decisions.

Use this data to make a bar graph.

Apple—6 children
Orange—4 children
Strawberry—9 children
Banana—3 children
Grapes—4 children



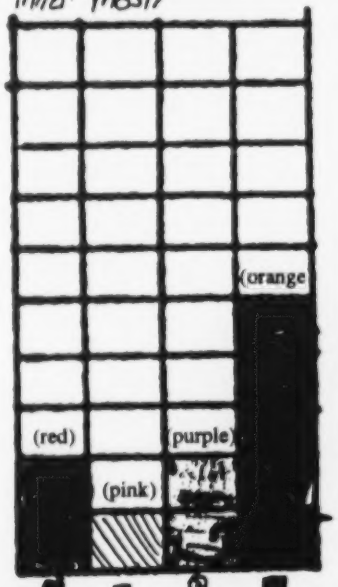
Show three things you know from the graph.

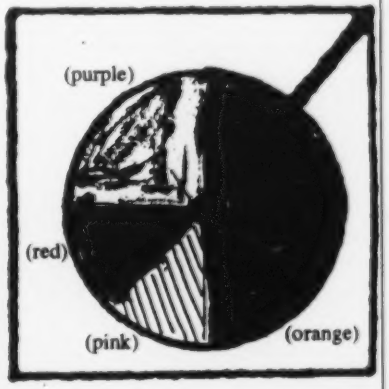
I learned that most people like Strawberrys and there are 26 people in that class

There is one more person liked grapes than bananas.

Draw and colour a spinner. Tell what colour you predict the spinner will point to most often. Test your prediction, using 10 spins. Describe your results.

Prediction: I think that it will to the orange the most I think orange will have 3. Purple will have the second most red will have the third most.



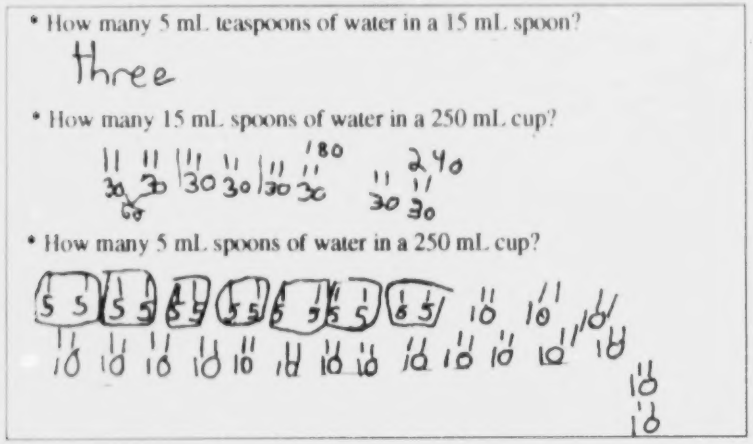


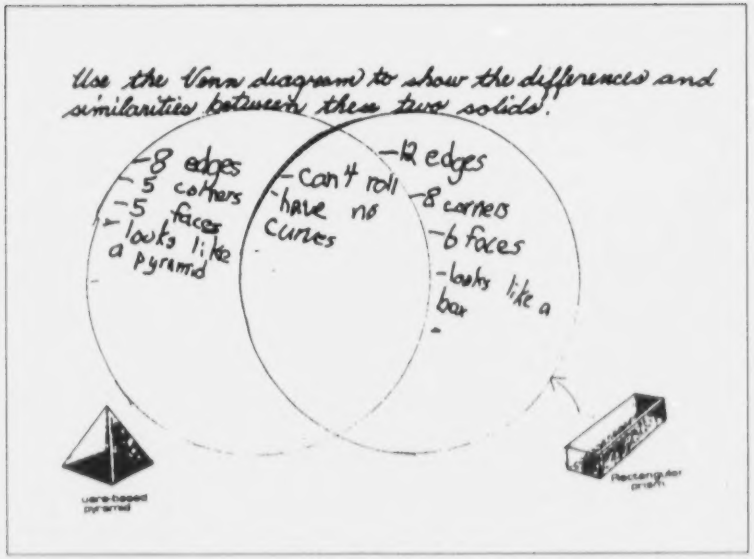
Results: I think the orange because it had the biggest space.

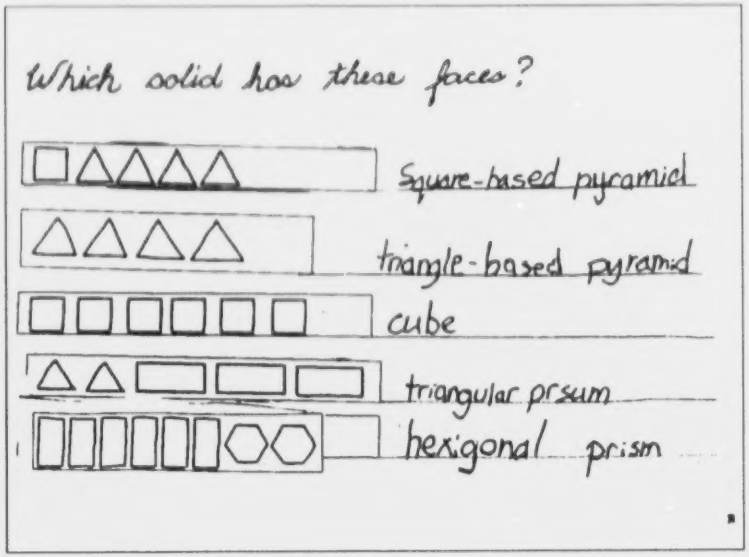
Shape and Space

There are two major parts in this strand—measurement and geometry. Measurement of shape and space involves instruction designed to provide students with numerous opportunities to learn about and practice measuring. These experiences make it possible for students to estimate, describe, and compare real-world phenomena, and to discover patterns and relationships which they can use to change or create shape and space. Measurement is a topic with direct connections to all other strands in mathematics, as well as to other subject areas.

Instruction in geometry is aimed at developing and strengthening spatial sense. This outcome is achieved by focusing instruction on activities that enhance student ability to identify and describe 2-D shapes and 3-D objects, and to discover relationships between and among these forms. The use of concrete materials and appropriate computer software is necessary and benefits all students.


• How many 5 mL teaspoons of water in a 15 mL spoon?
three
• How many 15 mL spoons of water in a 250 mL cup?
• How many 5 mL spoons of water in a 250 mL cup?





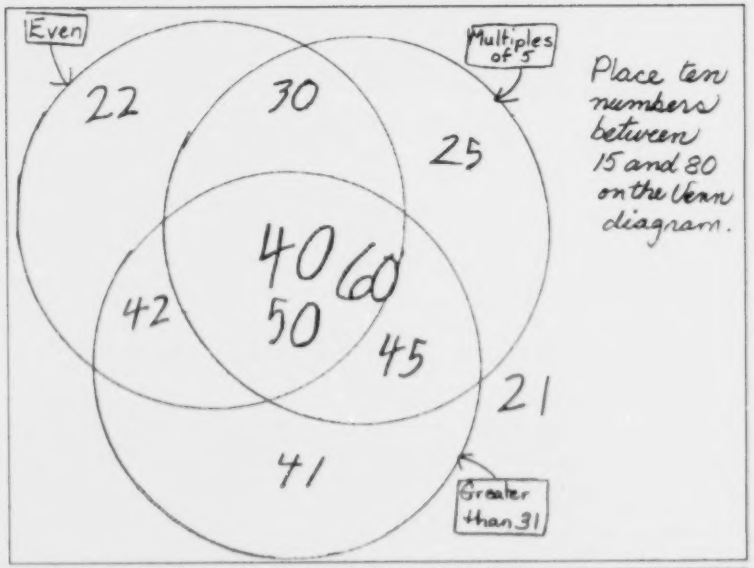
Number

The study of Number has two different, but connected, parts

Number Concepts involves the development of number meanings, characteristics, and relationships, along with all the patterns inherent in that study.
Number Operations involves instruction which helps students develop intuitions about when to use an operation, and the relative effects of operating on numbers. Instruction also helps the students to use various procedures for carrying out such operations, and to determine the most appropriate method for finding a solution.

The acquisition of number and operation sense is an ongoing process. Students need numerous, varied problem contexts with which they can relate. Though some need more experiences than others, all students benefit from instruction that includes manipulative materials. Concrete representations help students to visualize the size and relationships between and among quantities in problems. Materials and diagrams support students' verbal explanations and justifications of problem-solving efforts. They also provide powerful avenues for helping students forge meaningful connections with mathematical language and symbols.

Students need to develop number intuitions which make them equally capable of estimating and mentally calculating solutions, or using paper-pencil and technology to compute solutions. Their instructional experiences also should ensure that students recognize when each method is most appropriate.



You have a $25.00 gift certificate for the Science museum store. What will you buy? Will you have any credit left over?

Science Museum Store
Price List

$3.00	$4.00	$5.00
1. Origami paper	1. Kaleidoscope	1. Koosh ball
2. Crystal and gem magnets	2. Large magnifying bug box	2. Glow-in-the-dark solar system stickers
3. Furry stuffed seal pups	3. Sunprint kit	
4. Prism	4. Inflatable shark	

Receipt

2 items @ $3.00 $ 6.00
2 items @ $4.00 $ 8.00
1 items @ $5.00 $ 5.00
Total $ 19.00
Credit $ 6.00

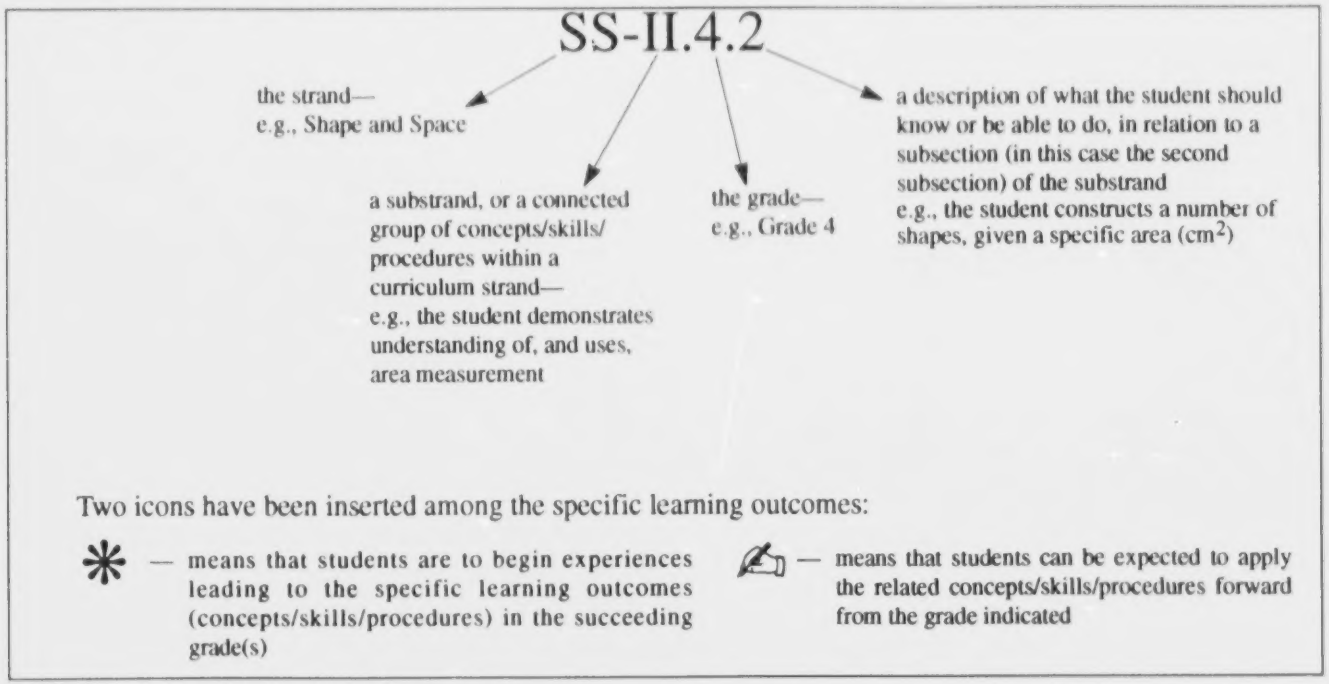
1 origami paper
1 prism
2 inflatable sharks
1 koosh ball

III. STUDENT LEARNING OUTCOMES FOR GRADES K-4

Student learning outcomes are concise descriptions of the knowledge and skills that students are expected to learn in mathematics. Student learning outcomes are expressed as general outcomes and specific outcomes

- **General student learning outcomes**—general statements identifying what students are expected to know and be able to do upon completion of a grade or series of grades.
- **Specific student learning outcomes**—concise statements identifying the component knowledge, skills, and attitudes of a general outcome.

The student learning outcomes for Kindergarten to Grade 5 mathematics, as provided in this Early Years document, reflect those outlined in the ***Western Framework***. The outcomes are organized by strand and by grade. A coding system has been developed for ease of cross-referencing this framework document with future Early Years curriculum implementation documents. The code can be interpreted as follows:


SS-II.4.2
the strand—
e.g., Shape and Space
a substrand, or a connected group of concepts/skills/ procedures within a curriculum strand—
e.g., the student demonstrates understanding of, and uses, area measurement
the grade—
e.g., Grade 4
a description of what the student should know or be able to do, in relation to a subsection (in this case the second subsection) of the substrand
e.g., the student constructs a number of shapes, given a specific area (cm^2)
Two icons have been inserted among the specific learning outcomes:
— means that students are to begin experiences leading to the specific learning outcomes (concepts/skills/procedures) in the succeeding grade(s)
— means that students can be expected to apply the related concepts/skills/procedures forward from the grade indicated

STRAND	SUB-STRAND	STUDENT LEARNING OUTCOMES		K (0)	1
PATTERNS AND RELATIONS (PR)	Patterns: Students will use patterns to describe the world and to solve problems.	GENERAL	Students will	identify and create patterns arising from daily experiences.	Identify, create, and compare patterns arising from daily experiences in the classroom.
		SPECIFIC *PR-I.*	The student demonstrates a readiness for patterning	— sorts objects, using a single, self-determined attribute *(PR-I.0.1)*	— sorts objects, using a single given attribute, or a single self-determined attribute *(PR-I.1.1)*
		PR-II.	uses patterns to describe the world	— recognizes, reproduces, extends, and creates patterns using actions and manipulatives, and orally describes them *(PR-II.0.1)*	— identifies, names, reproduces, extends, and creates patterns, using actions, manipulatives, diagrams, and spoken terms *(PR-II.1.1)*
			uses patterns to determine relationships	..... *	..... * .....
		PR-III.	uses patterns to solve problems	..... *	— begins to recognize patterns in the environment *(PR-III.1.1)*

2	3	4	5
Identify, create, describe, and translate numerical and non-numerical patterns arising from daily experiences in the school and on the playground.	Investigate, establish, and communicate rules for numerical and non-numerical patterns, including those found in the home, and use these rules to make predictions.	Investigate, establish, and communicate rules for, and predictions from, numerical and non-numerical patterns, including those found in the community.	Construct, extend, and summarize patterns, including those found in nature, using rules, charts, mental mathematics and calculators.
— sorts objects and shapes, using one or two attributes, and identifies attributes and rules in pre-sorted sets ***(PR-I.2.1)***	— sorts, concretely and pictorially, using two or more attributes ***(PR-I.3.1)***	✍	
— identifies, creates, extends, describes and compares both numerical and non-numerical patterns ***(PR-II.2.1)***	— uses objects and concrete models to explain the rule for a pattern, such as those found on addition and multiplication charts ***(PR-II.3.1)***	✍	— constructs and expands patterns in 2 and 3 dimensions (concretely and pictorially), and describes how a pattern grows, using everyday language in spoken and written form ***(PR-II.5.1)***
✱	✱	— identifies and explains mathematical patterns and relationships using • objects/models • charts/grids • Venn/Carroll/tree diagrams • graphs • technology ***(PR-II.4.2)***	— develops charts to record and reveal patterns, and predicts and justifies pattern extensions ***(PR-II.5.2)***
— translates patterns from one mode to another including concrete, pictorial, charted, spoken, written, and those patterns generated using technology ***(PR-III.2.1)***	— makes predictions based on addition and multiplication patterns ***(PR-III.3.1)***	— makes and justifies predictions, using numerical and non-numerical patterns ***(PR-III.4.1)***	— generates and extends number patterns from a problem-solving context ***(PR-III.5.1)***

STRAND	SUB-STRAND	STUDENT LEARNING OUTCOMES	K (0)	1
STATISTICS AND PROBABILITY (SP)	Data Analysis: Students will collect, display, and analyze data to make predictions about a population.	GENERAL Students will	Collect and organize, with assistance, data based on first-hand information.	Collect, organize, and describe, with guidance, data based on first-hand information.
		SPECIFIC *SP-I.* The student develops a plan to address a question/problem involving or requiring data		
		composes questions and categories	*	*
		selects data source(s)	— chooses, with assistance, first-hand sources for obtaining information *(SP-I.0.2)*	— chooses, with guidance, first-hand sources for obtaining information *(SP-I.1.2)*
		predicts results of the data collection process	.....	.....
		SP-II. collects data, and evaluates the collection process		
		implements data collection method(s)	— collects, with assistance, first-hand information *(SP-II.0.1)*	— collects with guidance, first-hand information by · observation/counting · conducting surveys · measuring · performing simple experiments *(SP-II.1.1)*
		evaluates data collection process	.....	.....

2	3	4	5
Collect, display, and describe data, independently, based on first-hand information.	Collect first and second-hand information, display the results in more than one way, and interpret the data to make predictions.	Collect first and second-hand data, assess and validate the collection process, and graph the data.	Develop and implement a plan for the collection, display, and interpretation of data to answer a question.
— formulates, independently, the questions and categories for data collection *(SP-I.2.1)*			— identifies a question to generate appropriate data *(SP-I.5.1)*
— chooses, independently, first-hand sources of information *(SP-I.2.2)*	— chooses from first and second-hand sources of information *(SP-I.3.2)*	— selects a sample or population, and organizes the collection of data *(SP-I.4.2)*	— distinguishes between a total population and a sample of that population *(SP-I.5.2)*
			— predicts results *(SP-I.5.3)*
— collects, independently, first-hand information, choosing an appropriate recording method such as tally marks to record data *(SP-II.2.1)*	— collects data, using measuring devices and print/technology resources *(SP-II.3.1)*		— uses a variety of methods to collect and record data *(SP-II.5.1)*
		— discusses the process by which the data was collected *(SP-II-4-2)*	— discusses the reasonableness of data and results *(SP-II.5.2)*

STRAND	SUB-STRAND	STUDENT LEARNING OUTCOMES	K (0)	1
STATISTICS AND PROBABILITY (SP)	**Data Analysis: Students will collect, display, and analyze data to make predictions about a population.**	SPECIFIC cont'd		
		SP-III. analyzes and displays data		
		analyzes, manipulates, and operates on data	*	*
		plots and graphs data	— constructs concrete-object graphs, with assistance, using 1:1 correspondence *(SP-III.0.2)*	— constructs concrete-object graphs and pictographs, with guidance, using 1:1 correspondence *(SP-III.1.2)*
		SP-IV. communicates and interprets data		
		discusses data and poses questions	— compares data in 2 categories, using such words as more, less, the same *(SP-IV.0.1)*	— compares data, using appropriate language, including quantitative terms such as how many more, and poses oral questions in relation to the data gathered *(SP-IV.1.1)*
		draws conclusions and makes predictions based on data	*	*

2	3	4	5
— organizes data, independently, using such graphic organizers as diagrams, charts, and lists *(SP-III.2.1)*	— uses rank ordering to organize data, and obtains new information by performing arithmetic operations on the data *(SP-III.3.1)*	— manipulates the data to create intervals for both tables and graphs *(SP-III.4.1)*	— creates classifications and ranges for grouping data *(SP-III.5.1)*
— constructs and labels, independently, concrete-object graphs, pictographs, and bar graphs *(SP-III.2.2)*	— displays data, using more than one way to display the same data *(SP-III.3.2)*	— constructs a bar graph and a pictograph, using many to one correspondence, and justifies the choice of intervals and correspondence used *(SP-III.4.2)*	— displays data by hand or by computer in a variety of ways, including · frequency diagrams · line plots · broken-line graphs *(SP-III.5.2)*
— discusses data, and generates new questions from displayed data *(SP-IV.2.1)*	..... ✍	..... ✳	— evaluates the graphic presentation of data to ensure clear representation of the results *(SP-IV.5.1)*
— draws and communicates appropriate conclusions *(SP-IV.2.2)*	— makes predictions and inferences when solving similar problems *(SP-IV.3.2)*	..... ✍	— makes inferences to generate a conclusion about the data *(SP-IV.5.2)*

STRAND	SUB-STRAND	STUDENT LEARNING OUTCOMES	K (0)	1
STATISTICS AND PROBABILITY (SP)	Chance and Uncertainty: Students will use experimental or theoretical probability to represent and solve problems involving uncertainty.	GENERAL Students will		Describe the concept of chance and chance events, using ordinary language.
		SPECIFIC *SP-V.* The student demonstrates an understanding of, and uses the concept of, uncertainty		
		predicts and communicates chance/probability	*	— predicts the chance of an event happening, using the terms never, sometimes, always *(SP-V.1.1)*
		conducts simple probability experiment to explain chance/probability		*
		represents and communicates theoretical probability		

2	3	4	5
Use simple experiments, designed by others, to illustrate chance.	Use simple probability experiments, designed by others, to explain outcomes.	Design and use simple probability experiments to explain outcomes.	Predict outcomes, conduct experiments, and communicate the probability of single events.
— describes the likelihood of an outcome, using terms such as likely, unlikely, expect, probably ***(SP-V.2.1)***	— describes the likelihood of an outcome, using terms such as more likely, unlikely, equal chance ***(SP-V.3.1)***	— identifies an outcome as possible, impossible, certain, uncertain, and compares outcomes as equally likely, more likely, less likely ***(SP-V.4.1)***	— describes events, using the vocabulary of probability: best/worst chance; probable/improbable; always/more likely/equally likely/less likely/ never ***(SP-V.5.1)***
— makes a prediction based on a simple probability experiment ***(SP-V.2.2)***	— conducts a probability experiment, chooses an appropriate recording method, and draws conclusions from the results ***(SP-V.3.2)***	— designs and conducts experiments to answer one's own questions ***(SP-V.4.2)***	— conducts probability experiments, explains the results using the language of probability, and demonstrates that results are not influenced by age, experience, or skill of participants ***(SP-V.5.2)***
		*	— lists all possible outcomes of an experiment involving a single event ***(SP-V.5.3)***

STRAND	SUB-STRAND	STUDENT LEARNING OUTCOMES	K (0)	1
SHAPE AND SPACE (SS)	Measurement: Students will describe and compare everyday phenomena, using either direct or indirect measurement.	GENERAL Students will	Demonstrate awareness of measurement.	Estimate, measure, and compare, using whole numbers and non-standard units of measure.
		SPECIFIC *SS-I.* The student demonstrates an understanding of, and uses linear measurement		
		measures and communicates lengths	— classifies and describes linear attributes, (long, short) and arranges objects in order of size, by length or height *(SS-I.0.1)*	— selects an appropriate non-standard unit, and estimates, measures, records, compares, and orders objects by length, height and distance around *(SS-I.1.1)*
		visualizes and constructs lengths	.....	..... * .....
		discovers and uses (inter-) relationships	.....	.....
		SS-II. demonstrates an understanding of, and uses area measurement		
		measures and communicates area	— covers a surface with a variety of objects *(SS-II.0.1)*	— estimates the number of uniform objects or shapes, or the number of irregular shapes that will cover a give area, and verifies by covering and counting *(S-II.1.1)*
		visualizes and constructs area	.....	..... * .....

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Estimate, measure, and compare, using standard units for length, and primarily non-standard units for other measures.	Estimate, measure, and compare using whole numbers and primarily standard units of measure.	Estimate, measure, and compare using decimal numbers and standard units of measure.	Use measurement concepts, appropriate tools, and the results of measurements to solve problems in everyday contexts.
— selects the most appropriate standard unit (cm, dm, m), and estimates, measures, records, compares, and orders objects by length, height, and distance around *(SS-I.2.1)*	— selects the most appropriate standard unit, including km, and estimates, measures, records, compares, and orders objects by length, height, and perimeter *(SS-I.3.1)*	— selects the most appropriate standard unit, including mm, and estimates, measures, records, compares, and orders objects by length, height, perimeter, and circumference *(SS-I.4.1)*	— evaluates the appropriateness of units and measuring tools in practical contexts, estimates and measures the perimeter of irregular shapes, and recognizes and explains the meaning of length, width, height, depth, thickness, perimeter, and circumference *(SS-I.5.1)*
— constructs items of specific lengths, including cm, dm, and m *(SS-I.2.2)*	✍	— constructs items of specific lengths, including mm *(SS-I.4.2)*	✍
✱	— describes the relationship among cm, dm, and m *(SS-I.3.3)*	— describes the relationships among mm, cm, dm, m, and km, and relates the size of a unit to the number of units used to measure length *(SS-I.4.3)*	— estimates and measures the effect of changing one or more dimensions of a rectangle on its perimeter, using manipulatives and diagrams *(SS-I.5.3)*
— estimates, measures, records, and compares the area of shapes, using non-standard units *(SS-II.2.1)*	— selects an appropriate non-standard unit, and estimates measures, records, compares, and orders shapes by area *(SS-II.3.1)*	— selects the most appropriate standard unit, and estimates, measures, records, compares, and orders shapes by area, using cm^2 and m^2 *(SS-II.4.1)*	— estimates and measures the area of irregular shapes by dividing them into parts *(SS-II.5.1)*
— constructs a shape, given a specific area in non-standard units *(SS-II.2.2)*	— constructs a variety of shapes given a specific area in non-standard units *(SS-II.3.2)*	— constructs a number of shapes given a specific area (cm^2) *(SS-II.4.2)*	✍

STRAND	SUB-STRAND	STUDENT LEARNING OUTCOMES	K (0)	1
SHAPE AND SPACE (SS)	Measurement: Students will describe and compare everyday phenomena, using either direct or indirect measurement.	SPECIFIC *SS-II* cont'd discovers and uses (inter-) relationships		
		SS-III. demonstrates an understanding of, and uses volume/capacity measurement measures and communicates volume/capacity	— uses the words full, empty, more, and less to talk about volume and capacity *(SS-III.0.1)*	
		visualizes and constructs volume/capacity		
		discovers and uses (inter-) relationships		
		SS-IV. demonstrates an understanding of, and uses mass/weight measurements measures and communicates mass/weight	— uses the words heavier or lighter to talk about the mass/weight of two objects *(SS-IV.0.1)*	— estimates, measures, records, and compares objects by mass/weight using non-standard units *(SS-IV.1.1)*
		visualizes and constructs mass/weight		
		discovers and uses (inter-) relationships		— recognizes that different objects may have the same mass *(SS-IV.1.3)*

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	*	— relates the size of a unit and the number of units needed to measure area *(SS-II.4.3)*	— compares area to perimeter of rectangles, and vice versa, using manipulatives and diagrams, and determines the effect of changing one or more dimensions of a rectangle on its area *(SS-II.5.3)*
— estimates, measures, records, compares, and orders containers, by capacity/volume using non-standard units *(SS-III.2.1)*	— selects an appropriate unit, and estimates, measures, records, compares, and orders containers by capacity, using non-standard units or litres *(SS-III.3.1)*	— estimates, measures, records, compares, and orders containers, by capacity, using mL and L *(SS-III.4.1)*	— estimates, measures, records, and orders containers by volume, using cm^3 *(SS-III.5.1)*
		*	— constructs objects of a specific volume, expressed in cm^3 *(SS-III.5.2)*
	*	— relates the size of the unit to the number of units needed to measure volume capacity *(SS-III.4.3)*	— relates cm^3 to mL, using concrete materials *(SS-III.5.3)*
— estimates, measures, records, compares, and orders the mass/weight of objects, using non-standard units *(SS-IV.2.1)*	— estimates, measures, records, compares, and orders objects by mass/weight, using standard units (g and kg) *(SS-IV.3.1)*	— solves problems involving mass/weight using g or kg *(SS-IV.4.1)*	— solves problems involving g, kg, and t *(SS-IV.5.1)*
*	— constructs objects to equal a given mass/weight *(SS-IV.3.2)*	✍	
— recognizes that the size and shape of an object does not necessarily determine its mass/weight *(SS-IV.2.3)*	✍	— relates g and kg, and the size of a unit to the number of units used to measure mass *(SS-IV.4.3)*	✍

STRAND	SUB-STRAND	STUDENT LEARNING OUTCOMES	K (0)	1
SHAPE AND SPACE (SS)	Measurement: Students will describe and compare everyday phenomena, using either direct or indirect measurement.	SPECIFIC cont'd		
		SS-V. demonstrates an understanding of, and uses angle measurement		
		visualizes and measures angles		
		SS-VI. demonstrates an understanding of, and uses time measurement		
		measures and communicates time	— uses the terms long time or short time to talk about the duration of events *(SS-VI.0.1)*	— estimates and measures the passage of time related to non-standard units, and compares the duration of activities *(SS-VI.1.1)*
		sequences events/time	*	— describes the time of day (e.g., morning), sequences events within one day and over several days, and names, in order, the days of the week and the seasons of the year *(SS-VI.1.2)*
		discovers and uses relationships		*

2	3	4	5
		— visualizes and describes angles in a variety of orientation according to whether they are a right angle, significantly less than a right angle, or significantly greater than a right angle *(SS-V.4.1)*	
— selects the most appropriate standard unit to measure a given time period, and estimates and measures the passage of time related to minutes and hours *(SS-VI.2.1)*	— estimates and measures the passage of time, using standard units (seconds, minutes, hours, days, weeks, months, years), and reads digital clocks and writes time to the nearest minute, using 12 hour notation *(SS-VI.3.1)*	— reads and writes time using am and pm, and reads an analog clock to the nearest minute *(SS-VI.4.1)*	— reads an analog clock to the nearest minute, and writes the time *(SS-VI.5.1)*
— names, in order, the months of the year, and reads the date on a calendar *(SS-VI.2.2)*	— reads and writes the days of the week and the months of the year *(SS-VI.3.2)*		— reads and writes SI notation for recording date and time *(SS-VI.5.2)*
— relates the number of days to a week, months to a year, minutes to an hour, hours to a day *(SS-VI.2.3)*	— relates seconds to minutes, days to years *(SS-VI.3.3)*	— relates years to decades, decades to centuries, centuries to millenniums *(SS-VI.4.3)*	— reads and writes time on a 24-hour clock *(SS-VI.5.3)*

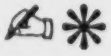
STRAND	SUB-STRAND	STUDENT LEARNING OUTCOMES	K (0)	1
SHAPE AND SPACE (SS)	Measurement: Students will describe and compare everyday phenomena, using either direct or indirect measurement.	SPECIFIC cont'd		
		SS-VII demonstrates an understanding of, and uses money measurement		
		recognizes/counts money	*	— recognizes and names Canadian coins *(SS-VII.1.1)*
		constructs amounts of money	— exchanges play money for objects in a play store *(SS-VII.0.2)*	*
		discovers and uses relationships	*	— states the value, in cents, of nickels and dimes, and creates equivalent sets of coins up to 10¢ *(SS-VII.1.3)*
		SS-VIII demonstrates an understanding of, and uses temperature measurements		
		measures and describes temperature	— uses words like hot, hotter; cold, colder; warm, warmer; and cool, cooler to talk about temperature *(SS-VIII.0.1)*	— describes and compares temperatures, using the senses *(SS-VIII.1.1)*

2	3	4	5
— recognizes all Canadian coins and bills to $10, and estimates, counts, and records, using the cent symbol only, the value of collections of coins up to $1 *(SS-VII.2.1)*	— recognizes the value of bills up to $100, and estimates, counts, reads, and records (using both money notations—89¢ and $0.89) the value of collections of coins and bills up to $10 *(SS-VII.3.1)*	— estimates, counts, and records collections of coins and bills up to $50 *(SS-VII.4.1)*	✍
*	— makes purchases and change up to $10 *(SS-VII.3.2)*	— makes purchases and change up to $50 *(SS-VII.4.2)*	✍
— states the value, in cents, of quarters, a dollar, and bills to $10, and creates equivalent sets of coins (using pennies, nickels, and dimes) up to $1 *(SS-VII.2.3)*	— creates and recognizes that a given value of money can be represented in many different ways *(SS-VII.3.3)*	✍	
— uses a thermometer to determine rising and falling temperatures *(SS-VIII.2.1)*	— estimates, reads, and records temperature to the nearest degree C, and relates temperature to everyday situations *(SS-VIII.3.4)*	✍	

STRAND	SUB-STRAND	STUDENT LEARNING OUTCOMES	K (0)	1
SHAPE AND SPACE (SS)	Students will describe characteristics of 3-D objects and 2-D shapes, and analyze the relations among them.	GENERAL Students will	Sort, classify, and build real-world objects.	Explore and classify 3-D objects and 2-D shapes, according to their properties.
	3-D Objects and 2-D Shapes:	SPECIFIC *SS-IX.* The student investigates 3-D objects		
		identifies, compares, and describes objects . . .	— identifies, sorts, and classifies 3-D objects in the environment, and describes, and discusses objects, using such words as big, little, round, like a box, like a can *(SS-IX.0.1)*	— explores and describes 3-D objects according to one attribute *(SS-IX.1.1)*
		visualizes, constructs, and rearranges objects ..	— builds 3-D objects *(SS-IX.0.2)*	— observes and builds a given 3-D object *(SS-IX.1.2)*
		analyzes and uses (inter-) relationships	. . . . . *	. . . . . * . . . . .
		SS-X. investigates 2-D shapes		
		identifies, compares, and describes shapes . . .	. . . . . *	— identifies, names, and describes specific 2-D shapes as · circles · triangles · rectangles and compares, sorts, and classifies 2-D shapes *(SS-X.1.1)*

2	3	4	5
Name, describe, and construct a variety of 3-D objects and 2-D shapes.	Describe, classify, construct, and relate 3-D objects and 2-D shapes.	Describe, classify, construct, and relate 3-D objects and 2-D shapes, using mathematical vocabulary.	Use visualization of 3-D objects and 2-D shapes to solve spatial problems.
— identifies, names, classifies, and describes 3-D objects · cubes · spheres · cones · cylinders · pyramids *(SS-IX.2.1)*	— identifies and counts faces, vertices, and edges of 3-D objects, and compares and contrasts two 3-D objects *(SS-IX.3.1)*	— compares and contrasts · pyramids · prisms · pyramids and prisms *(SS-IX.4.1)*	..... ✍ .....
— builds the skeleton of a 3-D object *(SS-IX.2.2)*	— recognizes congruent (identical) 3-D solids with rectangular faces, and demonstrates that a rectangular solid has more than one net *(SS-IX.3.2)*	..... ✍ ✳	— builds, represents, and describes geometric objects *(SS-IX.5.2)*
— explores faces, vertices, and edges of 3-D objects, and describes how a skeleton relates to a 3-D object *(SS-IX.2.3)*	— identifies and names faces of a 3-D object with appropriate 2-D names, and describes and names pyramids and prisms by the shape of the base *(SS-IX.3.3)*	..... ✍ ✳	— completes the drawing of a 3-D object, on grid paper, given the front face *(SS-IX.5.3)*
..... ✍	..... ✳	— identifies and sorts specific quadrilaterals, including squares, rectangles, and parallelograms *(SS-X.4.1)*	— identifies and classifies quadrilaterals, including trapezoids *(SS-X.5.1)*

STRAND	SUB-STRAND	STUDENT LEARNING OUTCOMES	K (0)	1
SHAPE AND SPACE (SS)	Students will describe characteristics of 3-D objects and 2-D shapes, and analyze the relations among them.	SPECIFIC *SS-X* cont'd		
		visualizes, constructs, and rearranges shapes		*
		analyzes and uses (inter-) relationships		
		SS-XI investigates lines and angles		
		identifies, compares, and describes lines and angles		
	3-D Objects and 2-D Shapes:	visualizes and constructs lines and angles		*
		analyzes and uses (inter-) relationships		

2	3	4	5
— builds and rearranges a pattern, using a set of 2-D shapes, and matches and makes identical (congruent) 2-D shapes *(SS-X.2.2)*	— recognizes congruent (identical) 2-D shapes *(SS-X.3.2)*	— designs and constructs nets for pyramids and prisms *(SS-X.4.2)*	— builds, represents, and describes shapes, and covers a given 2-D shape with tangram pieces *(SS-X.5.2)*
		— relates nets to 3-D objects *(SS-X.4.3)*	— determines, experimentally, the minimum information needed to draw a given 2-D shape, and identifies and names polygons according to the number of sides, angles, and vertices *(SS-X.5.3)*
		— recognizes, from every day experience, and identifies · point · line · angle · parallel lines · intersecting lines · perpendicular lines · vertical lines · horizontal lines *(SS-XI.4.1)*	
(see *SS-I.2.2*)		— describes angles in a variety of orientations according to whether they are a right angle, significantly less than a right angle, or significantly greater than a right angle *(SS-XI.4.2)*	
	— explores, concretely, the concepts of perpendicular, parallel, and intersecting lines on 3-D objects *(SS-XI.3.3)*		— constructs, analyzes, and classifies triangles according to the side measures *(SS-XI.5.3)*

STRAND	SUB-STRAND	STUDENT LEARNING OUTCOMES	K (0)	1
SHAPE AND SPACE (SS)	Transformations: Students will perform, analyze, and create transformations.	GENERAL Students will	Describe, orally, the position of 3-D objects.	Describe, orally, the relative position of 3-D objects and 2-D shapes.
		SPECIFIC *SS-XII.* The student visualizes and uses spatial relationships and transformations		
		locates, describes, and uses position	— describes the relative position of 3-D objects, using such words as over, under, beside, between, inside, outside *(SS-XII.0.1)*	— describes the relative position of 3-D objects and 2-D shapes, using words such as near, far, left, right *(SS-XII.1.1)*
		identifies, describes, and uses motion	*	— matches size and shape of figures by superimposing one on top of the other; and describes reflections in a mirror *(SS-XII.1.2)*
		analyzes and uses (inter-) relationships		

2	3	4	5
Apply positional language, orally and in writing, to communicate motion.	Use numbers and direction words to describe the relative position of objects in one dimension, using everyday contexts.	Use numbers and direction words to describe the relative position of objects in two dimensions, using everyday contexts.	Use coordinates to describe the positions of objects in two dimensions and describe motion in terms of a slide, flip, or turn.
— communicates and applies positional language in oral, written, or numerical form *(SS-XII.2.1)*	— communicates and applies terms of direction such as north or south, and east or west, relates them to maps, and graphs whole number points on a horizontal or vertical number line *(SS-XII.3.1)*	— communicates and applies terms of direction such as north, south, east, and west, relates them to maps and grids, and places an object on a grid, using columns and rows *(SS-XII.4.1)*	— plots whole number ordered pairs in the first quadrant with intervals of 1, 2, 5, or 10, and identifies a point in the first quadrant using ordered pairs *(SS-XII.5.1)*
— creates symmetrical 2-D shapes by folding and reflecting *(SS-XII.2.2)*	— traces a path, using oral or written instructions *(SS-XII.3.2)*	— traces a path, using oral or written instructions, and writes instructions for a given path *(SS-XII.4.2)*	— recognizes motion as a slide (translation), turn (rotation) or flip (reflection), creates tessellations using regular polygons, and covers a surface, using one or more tessellating shapes *(SS-XII.5.2)*
	*	— creates and verifies symmetrical 2-D shapes by drawing lines of symmetry *(SS-XII.4.3)*	— identifies planes of symmetry by cutting 3-D solids, and recognizes tessellations created with regular and irregular shapes in the environment *(SS-XII.5.3)*

STRAND	SUB-STRAND	STUDENT LEARNING OUTCOMES		K (0)	1
NUMBER (N)	Number Concepts: Students will use number to describe quantities. Students will represent numbers in multiple ways.	GENERAL	Students will	Describe, orally, and compare quantities from 0 to 10, using number words in daily expressions.	Recognize and apply whole numbers from 0 to 100, and explore halves in familiar settings.
		SPECIFIC *N-I.*	The student demonstrates and applies number sense for whole numbers		
			understands and uses counting sequences and estimation strategies	— counts the number of objects in a set (0-10) **(N-I.0.1)**	— counts orally by 1s, 2s, 5s, and 10s to 100; and estimates, then counts the number of objects in a set (0-50), comparing the estimate with the actual number ***(N-I.1.1)***
			reads and writes numerals and number words	— explores the representation of single digit numbers, using a calculator or computer to represent numerals on a screen **(N-I.0.2)**	— reads and writes numerals to 20, reads number words to ten, and explores the representation of numerals (0-50), using a calculator or computer **(N-I.1.2)**
			recognizes, builds, compares, and orders sets	— builds, compares, and orders two sets of like objects, and describes relationships between them using the terms more than, greater than, less than, the same as, equal to ***(N-I.0.3)***	— recognizes, builds, compares, and orders sets that contain 0 to 50 elements ***(N-I.1.3)***

2	3	4	5
Recognize and apply whole numbers up to 1000, and explore fractions (halves, thirds, and fourths).	Develop a number sense for whole numbers 0 to 1000, and explore fractions (fifths and tenths).	Demonstrate a number sense for whole numbers 0 to 10 000, and explore proper fractions.	Demonstrate a number sense for whole numbers 0 to 100 000, and explore proper fractions and decimals.
— counts to 1000 by 1s, 2s, 5s, and 10s, and to 100 by 25s using respective multiples for starting points; estimates, then counts the number of objects in a set (0-100), comparing the estimate with the actual number; and uses ordinal numbers to 31 ***(N-I.2.1)***	— counts by 2s, 5s, 10s, and 100s to 1000, using random starting points, counts by 25s to 1000, using multiples of 25 as starting points; skip-counts backward by 2s, 5s, 10s, and 100s using respective multiples as starting points; estimates, then counts the number of objects in a set (0-1000), comparing the estimate with the actual count; and uses ordinal numbers to 100 ***(N-I.3.1)***	— uses skip counting (forward and backward) to support understanding of multiplication and division; estimates, then counts the number of objects in a set (0-1000), comparing the estimate to the actual number; and uses ordinal numbers to 1000 ***(N-I.4.1)***	— uses estimation strategies for determining quantities up to 100 000 ***(N-I.5.1)***
— reads and writes numerals to 100 and number words to 20 ***(N-I.2.2)***	— reads and writes numerals to 1000 and number words to 100 ***(N-I.3.2)***	— reads and writes numerals to 10 000 and number words to 1000 ***(N-I.4.2)***	— reads and writes numerals and number words to 100 000 ***(N-I.5.2)***
— recognizes, builds, compares, and orders sets that contain 0 to 100 elements ***(N-I.2.3)***	— recognizes, builds, compares, and orders sets that contain 0 to 1000 elements ***(N-I.3.3)***		

STRAND	SUB-STRAND	STUDENT LEARNING OUTCOMES	K (0)	1
NUMBER (N)	Number Concepts: Students will use number to describe quantities. Students will represent numbers in multiple ways.	SPECIFIC *N-I* cont'd represents, explains, and uses place value concepts	*	— represents and describes numbers to 50 in a variety of ways *(N-I.1.4)*
		recognizes, describes, and uses number characteristics		*
		SPECIFIC *N-II.* The student demonstrates and applies number sense for fractions and decimals		
		represents and describes fractions and decimals	*	— demonstrates, and explains orally, an understanding of halves as part of a shape or solid *(N-II.1.1)*
		understands and uses connections between and among fractions and decimals		

2	3	4	5
— represents and describes numbers to 100 in a variety of ways; demonstrates, concretely and pictorially, place value concepts to give meaning to numbers up to 100; and rounds numbers to the nearest 10 *(N-I.2.4)*	— represents and describes numbers to 1000 in a variety of ways; demonstrates, concretely and pictorially, place value concepts to give meaning to numbers up to 1000; and rounds numbers to the nearest 100 *(N-I.3.4)*	— represents and describes numbers to 10 000 in a variety of ways; demonstrates concretely, pictorially, and symbolically, place value concepts to give meaning to numbers up to 10 000; rounds numbers to the nearest thousand; and compares and orders whole numbers up to 10 000 *(N-I.4.4)*	— demonstrates, concretely, pictorially, and symbolically, an understanding of place value from hundredths, including comparing and ordering whole numbers *(N-I.5.4)*
— demonstrates if a number from 1 to 100 is odd or even *(N-I.2.5)*	— recognizes and explains if a number is divisible by 2, 5, and 10 *(N-I.3.5)*	— sorts numbers into categories by one or more attributes *(N-I.4.5)*	— recognizes, models, and describes multiples, factors, composites, and primes, and sorts numbers into categories by one or more attributes *(N-I.5.5)*
— illustrates and explains halves, thirds, and fourths as part of a region or set *(N-II.2.1)*	— illustrates and explains fifths and tenths as part of a region or set *(N-II.3.1)*	— illustrates and explains hundredths as part of a region or set *(N-II.4.1)*	— represents and describes proper fractions, and decimals to hundredths, concretely, pictorially, and symbolically *(N-II.5.1)*
. . . . .	. . . . . *	— connects proper fractions to decimals, (tenths and hundredths) using manipulatives, diagrams, and symbols *(N-II.4.2)*	— represents and describes equivalent fractions, concretely, pictorially, and symbolically *(N-II.5.2)*

Number

STRAND	SUB-STRAND	STUDENT LEARNING OUTCOMES		K (0)	1
NUMBER (N)	Number Concepts: Students will use number to describe quantities. Students will represents numbers in multiple ways.	SPECIFIC	*N-II* cont'd		
			compares and orders fractions and decimals		
		N-III.	demonstrates and applies number sense for integers		
			represents and explains integers		
			compares and orders integers		
		N-IV.	demonstrates and applies number sense for ratio and percent		
			represents and explains ratio and percent		

2	3	4	5
	*	*	— compares and orders proper fractions, and decimals to hundredths *(N-II.5.3)*
			*
			*

STRAND	SUB-STRAND	STUDENT LEARNING OUTCOMES		K (0)	1
NUMBER (N)	Number Operations: **Students will demonstrate an understanding of and proficiency with calculations. Students will decide which arithmetic operation(s) can be used to solve problems and then solve the problems.**	GENERAL	Students will	Demonstrate awareness of addition and subtraction.	Apply informal methods of addition and subtraction on whole numbers—maximum sum of 18.
		SPECIFIC *N-V.*	The student understands, performs, and verifies number calculations		
			represents, explains, and applies addition and subtraction processes	— represents the processes of addition and subtraction through role playing and the use of manipulatives *(N-V.0.1)*	— uses manipulatives and diagrams to demonstrate and to describe the processes of addition and subtraction of numbers to 18 *(N-V.1.1)*
			recalls facts	.....	..... * .....
			represents, explains, and applies multiplication and division processes	.....	.....
			recalls facts	.....	.....

2	3	4	5
Apply a variety of addition and subtraction strategies on whole numbers to 100, and use these operations in solving given and student-created problems.	Apply an arithmetic operation (addition, subtraction, multiplication, and division) on whole numbers, and illustrate its use in creating and solving problems.	Apply arithmetic operations on whole numbers, illustrate their use in creating and solving problems, and demonstrate understanding of addition and subtraction of decimals (tenths and hundredths).	Apply arithmetic operations on whole numbers and decimals, and illustrate their use in creating and solving problems.
— uses manipulatives, diagrams and symbols to demonstrate and to describe multiple strategies for determining sums and differences of numbers to 100, with and without regrouping	— uses manipulatives, diagrams, and symbols, in problem-solving contexts, to demonstrate and to describe multiple strategies for determining sums and differences to 1000	— uses manipulatives, diagrams, and symbols, in problem-solving contexts, to demonstrate and to describe multiple strategies for determining sums and differences to 10 000, and uses manipulatives and diagrams to add and subtract decimals (tenths and hundredths) ***(N-V.4.1)***	— uses manipulatives, diagrams, and symbols, in problem-solving contexts, to demonstrate and to describe the addition and subtraction of whole numbers and of decimals to hundredths ***(N-V.5.1)***
— recalls addition and subtraction facts to 10 ***(N-V.2.1)***	— recalls addition and subtraction facts to 18 ***(N-V.3.1)***		
..... *	— uses manipulatives, diagrams, and symbols to demonstrate and describe the processes of multiplication and division in problem-solving contexts (maximum products and dividends to 50)	— uses manipulatives, diagrams, and symbols to demonstrate and describe the processes of multiplication and division in problem-solving contexts (3 digit by 1 digit for multiplication, and 2 digit by 1 digit for division)	— uses estimation, mental calculation, computation, and verification for whole number products (3 digit by 2 digit) and quotients (3 digit by 1 digit), and uses manipulatives, diagrams, and symbols to multiply and divide decimals to hundredths using single-digit, whole number multipliers and divisors in given problem-solving contexts ***(N-V.5.2)***
..... *	— recalls multiplication and divisions facts to 49 (7 x 7 on a multiplication grid) ***(N-V.3.2)***	— recalls multiplication and division facts to 81 (9 x 9 on a multiplication grid) ***(N-V.4.2)***	

STRAND	SUB-STRAND	STUDENT LEARNING OUTCOMES		K (0)	1
NUMBER (N)	Number Operations: Students will demonstrate an understanding of and proficiency with calculations. Students will decide which arithmetic operation(s) can be used to solve problems and then solve the problems.	GENERAL	Students will	.....	.....
		SPECIFIC *N-VI.*	The student chooses, and justifies choice of , operation(s) and method(s) of calculation to solve problems and to verify solutions	.....	..... * .....

120

121

2	3	4	5
Use an appropriate calculation strategy or technology to solve problems.	Use and justify an appropriate calculation strategy or technology to solve problems.	Use and justify an appropriate calculation strategy or technology to solve problems.	Use and justify an appropriate calculation strategy or technology to solve problems.
— uses a variety of estimation and mental mathematics strategies for solving addition and subtraction problems, and uses manipulatives and diagrams to demonstrate the processes of multiplication and division *(N-VI.2.1)*	— justifies the method used to calculate sums and differences choosing from estimation strategies, mental mathematics strategies, manipulatives, algorithms, and calculators; uses estimation, inverse operations or calculators to verify solutions for problems involving addition and subtraction; and uses estimation and mental mathematics strategies to calculate products and quotients *(N-VI.3.1)*	— justifies the method used to calculate products and quotients, choosing from estimation strategies, mental mathematics strategies, manipulatives, algorithms, and calculator; and uses estimation, inverse operations or calculators to verify solutions for problems involving multiplication and division *(N-VI.4.1)*	— uses multiple operations; justifies methods used to solve multi-step problems; and accepts that other methods may be equally valid *(N-VI.5.1)*

IV. GRADE 3 STANDARDS

PURPOSE

Grade 3 Standards has been developed by Manitoba Education and Training with the assistance of Grade 3 teachers representing three school program areas: English Program, Français Program, and French Immersion Program. Information has been drawn from the ***Western Framework***, existing ***Manitoba K-4 Mathematics Curricula***, and Ontario's ***Common Curriculum, Provincial Standards Mathematics, Grades K-9***. ***Grade 3 Standards*** represents the best knowledge and experience available at the time of drafting, and is likely to evolve and improve as time passes and more educators work with and react to it.

This portion of the ***K-4 Mathematics—Curriculum Framework of Outcomes and Grade 3 Standards*** document will be used in several different ways. (See figure 2 on page 55). The ***Grade 3 Standards*** will primarily be used by teachers from Kindergarten to Grade 3 as a document which describes and illustrates what students should know and be able to do at the end of the first four years in an Early Years mathematics program. It is expected that all teachers from Kindergarten to Grade 3, in each school, will work together to develop a mathematics program that provides the experiences and instruction necessary for their students to perform within the range of standards described for students who are completing Grade 3. The document also provides information on a variety of assessment practises that can be used to provide data that will assist teachers in making programming decisions.

Grade 3 teachers should find the information in ***Grade 3 Standards*** to be of particular assistance in assessing and reporting progress. They may use the Characteristics of Student Performance, together with Performance Indicators and Illustrative Examples to assess and evaluate student work, report on student achievement, and to plan, with the student and parents, for on-going student learning.

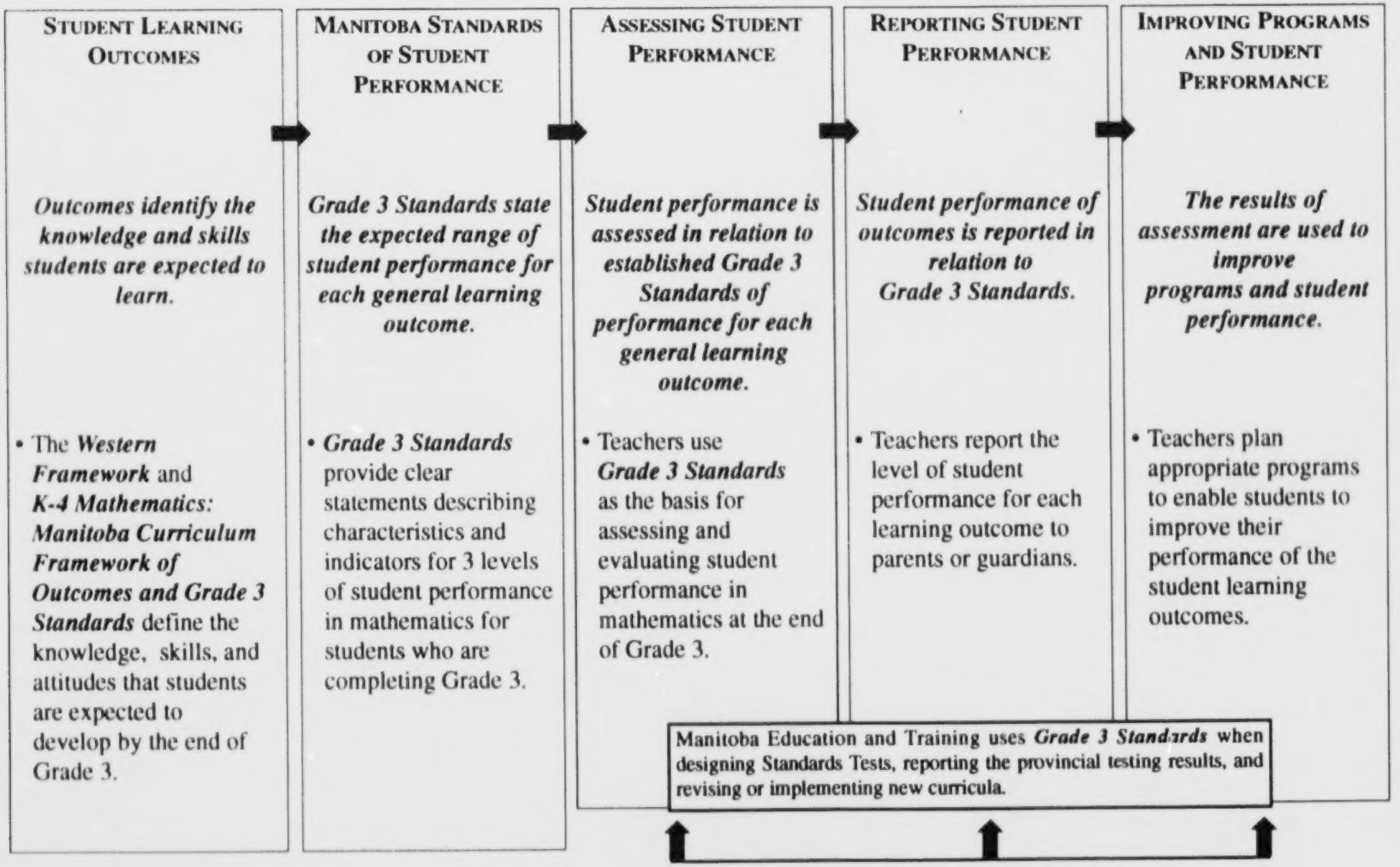
Manitoba Education and Training—Assessment and Evaluation Unit—will use the ***Grade 3 Standards*** as the basis for determining student levels of mathematical performance throughout the province. It provides the Assessment and Evaluation Unit with information to guide both the development of a provincial standards test for all students completing their Grade 3 program, and to guide the interpretation of the test results. (Note: Exceptional students who have been provided with Individual Educational Plans—I.E.P.s— may be involved in Standards testing at the discretion of each child's I.E.P. team.) Manitoba Education and Training will re-examine the ***Grade 3 Standards*** established for the end of Grade 3 on an on-going basis, and it is possible that some changes may occur as the Assessment and Evaluation Unit analyzes the results of standards testing. This on-going analysis also may result in curricular changes, as Manitoba Education and Training seeks to improve mathematics programming and student performance.

The ***Grade 3 Standards*** also should help teachers at other grade levels, school administrators, parents, and other interested citizens to develop a clear and consistent picture of expected levels of student mathematical performance upon completion of Grade 3.

There are two parts to this portion of the mathematics framework document. The first part deals with assessment as part of the structure of mathematics, and includes descriptions of a variety of assessment strategies. The second part describes the standards of student performance for students who are completing Grade 3.

figure 2

Using Manitoba Outcomes and Standards in Assessing, Reporting, and Improving Student Achievement—Grade 3


STUDENT LEARNING OUTCOMES
MANITOBA STANDARDS OF STUDENT PERFORMANCE
ASSESSING STUDENT PERFORMANCE
REPORTING STUDENT PERFORMANCE
IMPROVING PROGRAMS AND STUDENT PERFORMANCE
Outcomes identify the knowledge and skills students are expected to learn.
Grade 3 Standards state the expected range of student performance for each general learning outcome.
Student performance is assessed in relation to established Grade 3 Standards of performance for each general learning outcome.
Student performance of outcomes is reported in relation to Grade 3 Standards.
The results of assessment are used to improve programs and student performance.
• The Western Framework and K-4 Mathematics: Manitoba Curriculum Framework of Outcomes and Grade 3 Standards define the knowledge, skills, and attitudes that students are expected to develop by the end of Grade 3.
• Grade 3 Standards provide clear statements describing characteristics and indicators for 3 levels of student performance in mathematics for students who are completing Grade 3.
• Teachers use Grade 3 Standards as the basis for assessing and evaluating student performance in mathematics at the end of Grade 3.
• Teachers report the level of student performance for each learning outcome to parents or guardians.
• Teachers plan appropriate programs to enable students to improve their performance of the student learning outcomes.
Manitoba Education and Training uses Grade 3 Standards when designing Standards Tests, reporting the provincial testing results, and revising or implementing new curricula.

ASSESSMENT WITHIN THE STRUCTURE OF MATHEMATICS

Assessment is the process of gathering evidence about a student's knowledge, skills, and attitudes. Assessment results are used to evaluate what a student values, knows, and can do. This evaluation can be used for making instructional decisions, monitoring or reporting student progress, and evaluating programs.

Mathematics assessment takes place within a structure of important components. (See figure 3 on page 57.) The structure provides the parameters within which ***Grade 3 Standards*** was developed and is used. ***Grade 3 Standards*** is designed to support consistent assessment of student achievement in Manitoba mathematics classrooms by providing clearly defined student performance expectations.

figure 3

ASSESSMENT WITHIN THE STRUCTURE OF MATHEMATICS

MATHEMATICAL STRANDS, with general and specific learning outcomes stating the expectations for knowledge, skills, and values to be achieved by students who are completing Grade 3.

MB ENGLISH K-4 STRANDS	Number Concepts	Number Operations	Patterns and Problem-Solving	Measurement	Geometry	Data Management
MB FRENCH K-4 STRANDS	Number Concepts	Number Operations	Problem-Solving is integrated in all strands	Measurement	Geometry	Data Management (includes Patterns)
WESTERN FRAMEWORK STRANDS	**NUMBER**		**PATTERNS AND RELATIONS**	**SHAPE AND SPACE**		**STATISTICS AND PROBABILITY**
Level 3— performing above the standard set for the grade.						
Level 2— performing within the range set as the standard for the grade.						
Level 1— not yet performing within the range set as the standard for the grade.						

ASSESSING STUDENT LEARNING OF GENERAL AND SPECIFIC OUTCOMES

ESTABLISHED STANDARDS OF STUDENT PERFORMANCE

A VARIETY OF ASSESSMENT PRACTICES USED TO DETERMINE LEVEL OF STUDENT PERFORMANCE

BIG IDEAS—The processes of Problem-Solving, Communicating, Estimating and using Mental Mathematics, Making Connections, Reasoning, Using Technology, and Visualizing.

ASSESSMENT STRATEGIES

General and specific learning outcomes are the observable or measurable knowledge, skills, and values that students are expected to have acquired and developed at certain key stages of their schooling. They describe what students should know, should be able to do, and should value as a result of their learning experiences.

Mathematical competence involves communicating, problem-solving, higher-order thinking, creativity, persistence, and curiosity. A variety of assessment strategies should be used to provide students with opportunities to demonstrate these characteristics.

This portion of the document summarizes some of the strategies teachers use to assess how students process knowledge, and how well students learn. Included are

- observation
- discussions, conferences, and structured interviews
- journal and learning-log writing
- performance/authentic tasks
- investigations
- self/peer assessment
- paper-pencil quizzes and tests

These assessment strategies incorporate the following

- evaluating process as well as product
- evaluating what students know and how they think about mathematics
- evaluating student performance in a variety of modes, including demonstration and oral, pictorial, and written/symbolic representation
- using a broad range of mathematical tasks and taking a connected view of mathematics
- using manipulatives
- using calculators and computers
- recognizing such attitudinal outcomes as motivation and appreciation
- getting the student involved in the assessment process

A short description of each strategy is provided in this component of the Assessment Framework, along with at least one (sometimes only partial) sample student response.

An **Assessment Portfolio** is one method of involving students in the assessment and evaluation process. Students gather samples that they, and their teacher, think demonstrate their developing knowledge and skills. This involvement becomes a powerful way of motivating self-responsibility for learning. A brief description of the process and the contents of Assessment Portfolios is included at the end of the Assessment Strategies notes.

OBSERVATION

Observation is probably the most frequently used form of assessment. It can occur naturally during mathematics classes, and can be conducted when students work alone or in groups. Systematic observation can provide information about students' attitudes toward mathematics, their feelings about themselves as learners, their preferred learning styles, their areas of interest, work habits, and social development, and their development in the ability to use mathematical language and concepts.

It is important to record these observations. They assist in the development of meaningful programs for students and in providing useful information to parents.

May. 19
Tiffany handed in her booklet of polygons made from tangram pieces. "I loved Grandfather Tang's Story and doing this kind of math!" FIRST TIME ALL YEAR!!

Problem Solving Jan / Feb	Understands the problem/ question.	Develops a plan or strategy.	Finds a solution; showing work	Checks and explains.
Aaron	✓/? misinterpreted the question	drew a picture	yes but x no work	—
Catrina	✓/✓	✓ sorted coins and used a no. centre	✓ well organized	compared with peers and showed Aaron what she did.
Denetta	Had trouble with key words.	counted change without working	reached a solution, but eg. show process, little recording	Used calculator but not effectively

	Attitudes towards Mathematics		
	Working Style	Confidence and Involvement	Disposition Towards Math.
Aaron	2 Works well independently; not a willing group member unless in a leadership role	Volunteers strategies & predictions but seldom listens to or respects other students ideas, strategies, etc.	Enjoys solving problems using own methods, but seldom respects any one else's ideas.
Bob	2 Rather work with partner or group than alone; very cooperative in grp. work	Participates in discussions; listens to others; varies in ability take risks & persevere	Welcomes challenges if part of problem-solving team
Catrina	3 Works equally well as a member of a group or independently	Confident, creative, asks good questions, offers good suggestions, completes all work	Enjoys all math problems/activities/ investigations
Denetta	1 Willing, but needs support of others, including me, to complete math tasks	Often seeks confirmation for each action; participates in groups if tell what to do	Says she likes math.
Elvis	Needs partner to keep him on task; waits for partner or grp. to suggest what to do	Seldom shows self-confidence; offers ideas, solutions in groups or in whole-class discussions	Shows little pleasure in problem-solving or independent work
Fiona	3 Takes leadership role; works well independently & in grp; loves problem-solving	Confident; tries new ideas & methods; asks good questions; offers good suggestions	welcomes challenges; perseveres until satisfied with results;
Rajit	2 Works better alone than in group; not very willing to compromise with others	demonstrates creativity when facing new situations; tends not to value others ideas;	Enjoys solving problems by himself; takes risks and perseveres

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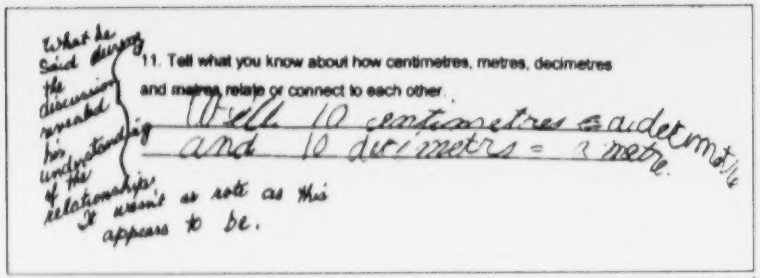
DISCUSSIONS, CONFERENCES, AND STRUCTURED INTERVIEWS

Discussions and student conferences are opportunities for the teacher and the student to share ideas. They provide a context for the exploration of a student's mathematical reasoning and for determining how well a student understands a concept or a procedure. They can be used to reveal how well a student explains solutions or to provide an opportunity for a student to justify thinking and reasoning. Discussions and student conferences also are useful for revealing student strengths and preferences, and for discussing alternative strategies.

Important insights into student knowledge, skills, and values revealed during an informal discussion or conference should be recorded and dated.

Structured interviews provide specific information on a student's construction of meaning for any concept, procedure, relationship, or connection. Structured interviews should be brief and conducted in a relaxed atmosphere. The teacher needs to be non-judgmental and to avoid engaging in instruction.

Structured interviews should be conducted periodically with all students. If time becomes an issue, interviews may be limited to students for whom a clear picture of achievement has not been established. The interview script should be designed to provide appropriate space for recording student responses and teacher impressions. The recording sheet can be stored in the teacher's recording system, or placed in the student's Assessment Portfolio.



What he said during the discussion revealed his understanding of the relationship. It wasn't as neat as this appears to be.

11. Tell what you know about how centimetres, metres, decimetres and metres relate or connect to each other.

Well 10 centimetres = a decimetre and 10 decimetres = 1 metre.

Grade 3 Interview Script / Recording Sheet — Measurement

Date June Name

1

T- (hold up a drinking straw) Estimate the length of this drinking straw in centimetres.

S- 15 cm

T- Tell me how you decided on your answer.

S- "I tried this at home and it was about 15cm. 1cm is about a finger width."

2 T- Suppose your estimate is equal to the actual length of the straw. About how many drinking straws will fit end to end in the length of a metre? "I think it's 100cm in a m."

S- about 6

T- Tell me how you decided on your answer. "I counted by 15's to 100. 15, 30, 45, 60, 75, 90"

3 T-Explain to me what "perimeter" means.

S- "It's something that's around something. If you measure a bathtub, it would be the outside of the tub."

4 T-Once again, let's say your estimated number of straws is the correct number to fit end to end in a metre. About how many drinking straws long is the perimeter of

5 desks in a row (7m actual)?

S- about 36 straws

T- Tell what you did mentally to arrive at your answer?

"Those 2 desks might be a m & then 1m more & then I doubled it."

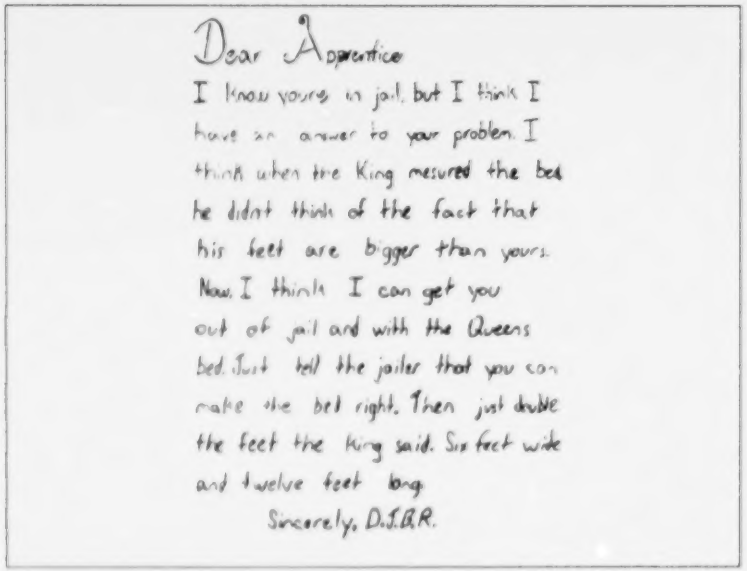
JOURNAL AND LEARNING-LOG WRITING

Journal writing represents an opportunity for students to produce pictures and written expressions of thoughts and feelings, to ask questions, and to comment on their learning experiences. This strategy for gathering assessment data is often left unstructured, i.e., the content and the format may be determined by the student. Journal writing allows a student to clarify thinking and to reflect on learning, using the various modes of mathematical communication. Journals often provide students with a safe forum for identifying strengths, weaknesses, and interests.

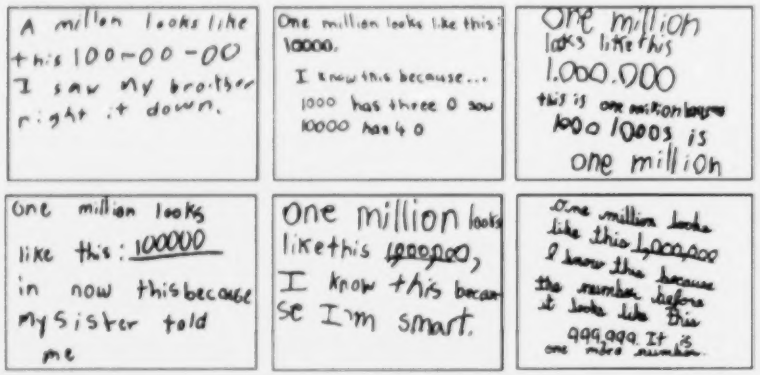
Some teachers instruct their students to keep a mathematics learning-log. It is similar to a writing journal, but it is used to have students respond to specific questions that have been planned as an integral part of instruction. Questions may be asked before, during, or following instruction. The learning-log is used to give students an opportunity to communicate their reflections using graphics, numerals, mathematical symbols, and writing that incorporates mathematical language. A learning-log entry also can reveal feelings and attitudes about learning.

Noteworthy journal and learning-log entries can be photocopied and added to a teacher's recording system, or placed in the student's Assessment Portfolio.

Journal response to *How Big is a Foot* by Rolf Myler.


Dear Apprentice
I know yours in jail, but I think I have an answer to your problem. I think when the King mesured the bed he didnt think of the fact that his feet are bigger than yours. Now, I think I can get you out of jail and with the Queens bed. Just tell the jailer that you can make the bed right. Then just double the feet the king said. Six feet wide and twelve feet long.
Sincerely, D.I.B.R.

Written before reading *How Much Is a Million* by David Swartz.


A million looks like this 100-00-00 I saw my brother right it down.
One million looks like this 10000. I know this because... 1000 has three 0 sow 10000 has 4 0
One million looks like this 1.000.000 this is one million because 1000 10000 is one million
one million looks like this: 100000 in now this because my sister told me
one million looks like this 1000000, I know this because Im smart.
One million looks like this 1,000,000 I know this because the number before it looks like this 999,999. It is one more number.

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PERFORMANCE/AUTHENTIC TASKS

This assessment strategy involves presenting students with designed or authentic mathematical tasks. Performance tasks place emphasis on the many mathematical processes cited earlier. Students are expected to provide a thorough account of the strategies and the reasoning needed to complete a task. It is critical that scoring rubrics be developed and shared with students so that students' efforts are well appraised. Teachers may want to include conferences or interviews as part of this assessment process.

Measurement Performance Task: Perimeter
Materials: 20 coloured square tiles

What does perimeter mean?

Part 1: Directions
Using 8 tiles of any colour, make shapes with the perimeters given. The tiles must have sides touching, not just corners.

1. perimeter of 16
2. perimeter of 12
3. perimeter of 14
4. perimeter of 18

Part 2: Directions
Use 10 tiles to make shapes with perimeters given. Tiles must have sides touching.

1. perimeter of 24
2. perimeter of 20
3. perimeter of 22
4. perimeter of 18

Part 3: Directions
Show your finished paper to your teacher. Try to answer the 2 questions your teacher will ask about your work.

Perimeter Scoring Rubric
Level 3 (high level response)

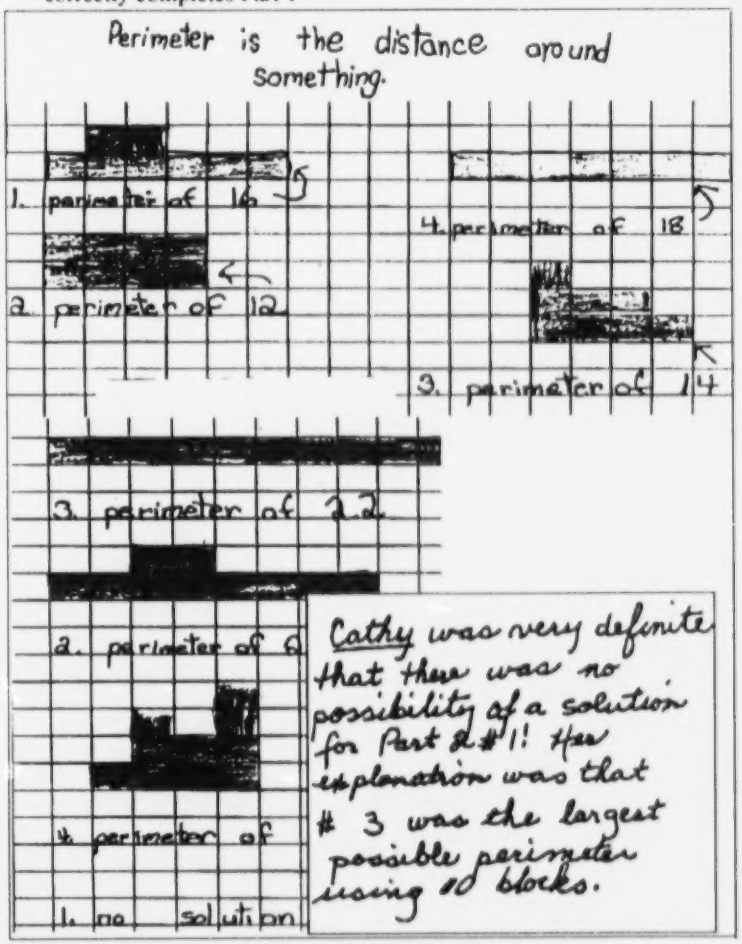
- knows the meaning of perimeter
- independently understands the task
- uses materials effectively
- correctly completes Parts 1 & 2
- can explain why a perimeter of 24 is impossible
- shows some insight into relationships between length of perimeter and shape when number of tiles (area) is kept constant

Level 2 (middle level response)

- knows meaning of perimeter
- uses materials to understand task
- correctly completes all possible shapes in Parts 1 and 2
- tries to explain why a perimeter of 24 is impossible

Level 1 (low level response)

- needs support to explain meaning of perimeter
- uses materials
- correctly completes Part 1


Perimeter is the distance around something.
1. perimeter of 16
2. perimeter of 12
4. perimeter of 18
3. perimeter of 14
3. perimeter of 22
2. perimeter of 8
4. perimeter of
1. no solution
Cathy was very definite that there was no possibility of a solution for Part 2 #1! Her explanation was that # 3 was the largest possible perimeter using 10 blocks.

INVESTIGATIONS

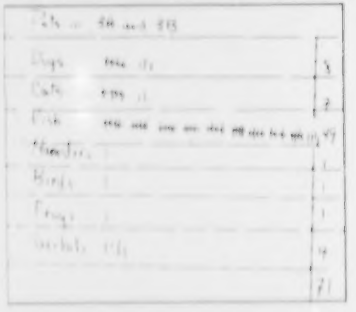
Mathematical investigations involve students in extended explorations of mathematical questions. An investigation may present students with mathematical situations that include thinking about and using ideas related to other subject areas. Mathematical investigations sometimes should grow out of interests shown or problems posed by students. It may take students days or weeks to complete an investigation. The investigative work involved is intended to provide information about students' abilities to

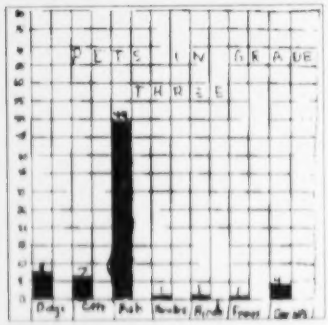
- apply and learn mathematical concepts and skills
- identify and define a problem
- make and carry out a plan
- create and interpret strategies
- collect and record necessary information
- organize data and look for patterns
- persist, looking for more information if needed
- discuss, review, revise, and explain results

Students should produce an adequate record of the stages of development, and results and conclusions of investigations. An outline of the scoring system, to be used for evaluating the processes used and the work produced, must be given to the students as they begin the investigation. It is advisable that students are involved in evaluating their investigative work. The students' reports, and photographs, charts, audio or video tapes, etc., can be stored in their Assessment Portfolios.

The following samples are courtesy of Grade 3 students in an elementary school in Manitoba.

What is the average number of pets for a grade three student?





Dear Room 104 Plowmans park Mississauga Ontario,
We have been comparing your class with out pet data. We had the same number of cats but you have one less dog. Your class has 13 more fish than we did but we both had the same number of turtles. We have three more rats than you do. Your class had less childern but more pets. Or pet data was almost the same but your class had nineteen more pets. Thank you for sending E-mail.
Your friends, Jani and Ashley.

459	dogs	563	cats	1632	fish	406	birds
113	hamsters	168	rabbits	48	gerbils	49	turtles
21	rats	61	guineapigs	1	crab	52	horses
100	sea anemones	24	lizards	32	spiders	1	squirrel
14	frogs	1	chinchilla	3	ferrets	19	mice
83	snails	1					
19	salamanders	3					
2	goats						

Total number of children in the survey: 913
Total number of classes responding: 41
Provinces represented: B.C., Manitoba, Ontario, Nova Scotia, P.E.I.
Total number of pets: 3906
Average number of pets per student—between 4 and 5

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SELF- OR PEER-ASSESSMENT

Self-assessment promotes the ability of students to reflect on their own efforts to use mathematical thinking processes, and their own success in understanding and applying concepts and procedures. Opportunities to reflect on their own learning help students to take ownership for that learning and help them to become independent thinkers.

Peer-assessment is usually achieved when a small group looks back on itself, seeking to understand group dynamics, and how they affect group work and production.

Self- and peer-assessment can be facilitated by means of a teacher- or student-prepared questionnaire, daily journal writing, and student or group conferences.

Learning to Work Together

Fill in each happy face to show how well your are learning to work cooperatively.

1. We listened to each others' ideas.

2. We each did our fair share of the work.

3. We finished our work on time.

4. Next time our group will try to

work faster

NEWSPAPER SCAVENGER HUNT

Names of your team members: _____ _____

_____ _____

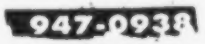
In a newspaper, find the following items. Cut them out and glue your examples next to the description.

1. The price of something to eat

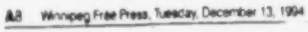
2. A street address

3. A number that gives a size

4. A phone number



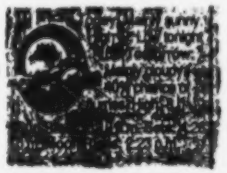
5. The date the paper was published



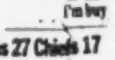
6. A number in a recipe

7. A number that names a distance

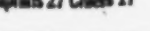
8. A number that names a temperature



9. A number written in words



10. The score of a game



PAPER-PENCIL QUIZZES AND TESTS

Paper-pencil quizzes and tests are another way for students to demonstrate what they know and can do. Several strategies can be used to help students feel that tests are important opportunities to learn and to demonstrate learning. These strategies include

- providing concrete materials, or at least access to materials that have been part of classroom instruction. These materials help students solve problems, even though they may not yet be capable of producing solutions in symbolic form.
- providing a picture or diagram as part of the information given in a problem. This helps students who experience difficulties with reading or interpreting print to visualize the information and to show what they have learned.
- reading or telling the context for some problems. This is especially important for students in the younger grades, and for students whose reading skills prevent them from demonstrating their mathematical knowledge and skills.
- providing some open-ended questions with no predetermined limits on solutions, procedures, or processes to be used for finding solutions. This type of problem is especially important if testing is to give students opportunities to show the breadth and depth of their thinking and learning.

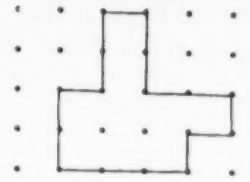
How many different ways can you use the D.I.M.E. solids to build a "flat?"

1. The dots in the diagram are 1 unit apart.

   a. What is the perimeter of the figure? 16

   b. What are the dimensions of a square with the same perimeter?

   4 × 4 = 16



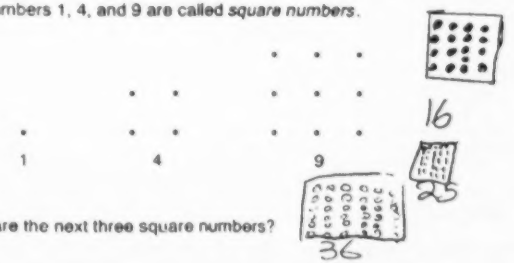
2. The table shows the number of book reports written by the third and fourth grades during a three-month period.

   a. In which month were the greatest number of book reports written? March

   b. Which grade wrote fewer book reports? 4

BOOK REPORTS WRITTEN		
Month	Grade 3	Grade 4
February	115	131
March	136	117
April	123	109

3. The numbers 1, 4, and 9 are called *square numbers*.



What are the next three square numbers?

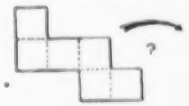
4. These are 3 different views of the same solid.

from the top from the side from the bottom

Name the solid.

squaer based piramid

5. This net can be folded to make a cube.



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ASSESSMENT PORTFOLIOS

Teachers and students who engage in developing Mathematics Portfolios for assessing progress and learning often establish two portfolios:

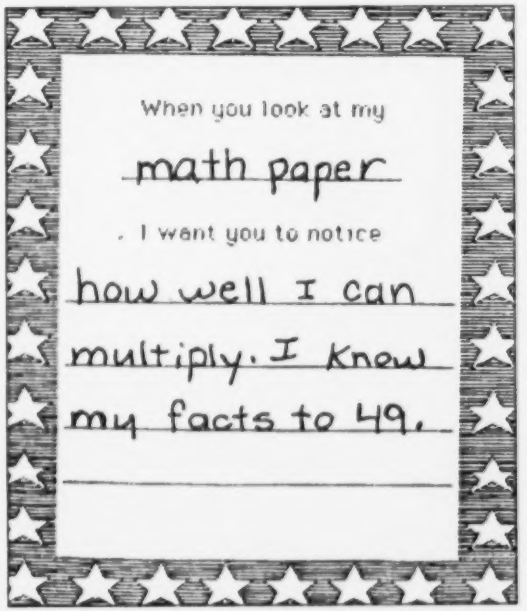
1. **A General Mathematics Portfolio**—a general collection of samples which may become examples of "best" performance or which demonstrate significant progress/learning for a given unit of work or time frame (e.g., 2 weeks).
2. **An Assessment Mathematics Portfolio**—a limited collection of samples, chosen by the student from the General Mathematics Portfolio, to exemplify the learning that has occurred. Included is a letter from the student indicating the reasons for selecting the particular samples. The teacher may place additional samples, anecdotal notes, etc. in the student's portfolio.

An Assessment Portfolio is intended to provide a picture of the student's performance and achievement over time. Student portfolios can provide

- evidence of knowledge and skill acquisition
- evidence of appropriate use of processes
- opportunities for the student to practice evaluating and selecting "best examples" of one's own performance and learning
- a permanent record of student work

An Assessment Portfolio may include the following personally-chosen and/or teacher-chosen examples of student work

- graphic/written descriptions of problem-solving, performance tasks, investigations, etc.
- photographs, video and audio tapes, flip-charts, etc. from assigned or self-designed project work and presentation
- excerpts from the student's mathematics journal and mathematics learning-log
- computer-generated examples of developing technology skills and knowledge
- student self-reports on what has been learned, on feelings about oneself as a learner, and on attitudes towards mathematics

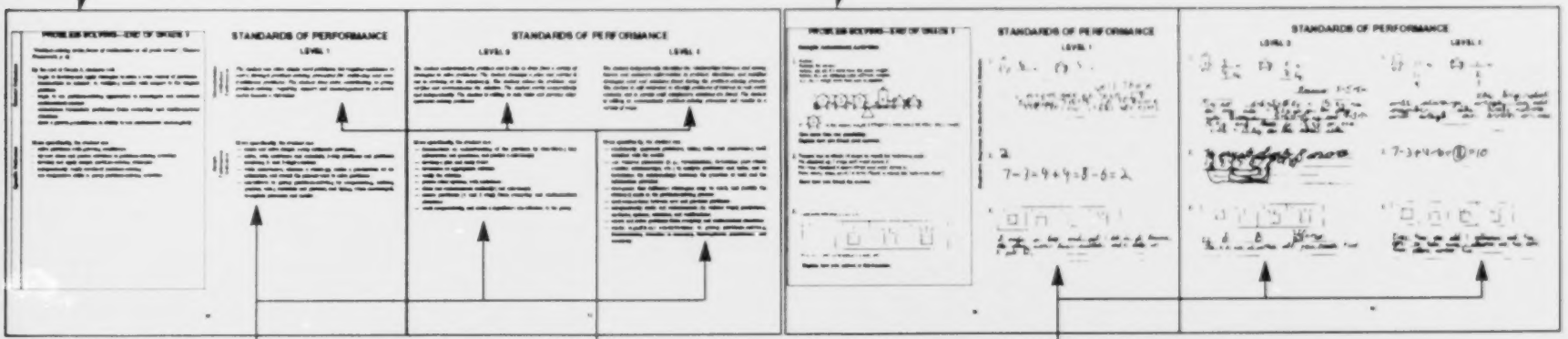


READING THE STANDARDS

The following pages identify the standards of student performance for each general learning outcome by the end of the Grade 3. There are four pages of information for each general learning outcome, organized as follows:

1. each general learning outcome, and its corresponding specific outcomes, is listed on the left side of the first page.

3. **sample assessment activities** are provided on the left side of the third page.



2. short paragraphs describing the **general characteristics of student performance** for each of 3 levels (see definitions for Levels 1 to 3 on page 69), along with a number of **sample performance indicators** for each, are found on the remainder of the first and second page. This information establishes the standards of student performance for the general learning outcome shown on the left side of the first page.

4. **sample responses** from Manitoba Grade 3 students, illustrating the differences in student performance at each of the 3 levels, are found on the remainder of the third and fourth pages.

DEFINING KEY TERMS

— **Characteristics of Student Performance:** holistic statements summarizing student performance at each of levels 1 to 3.

— **Sample Performance Indicators:** specific examples which describe what students should know and do to indicate achievement of a particular learning outcome. The statements are not intended to be exhaustive or restrictive. They will be helpful in determining both a level of student performance, and the quality of that performance, relative to the standard set for the learning outcomes.

— **Levels of Student Performance:**

Level 1: student performance is limited (i.e., not yet within the range set as the standard for the grade).

Level 2: student performance is competent or proficient (i.e., within the range set as the standard for the grade).

Level 3: student performance is outstanding or superior (i.e., above the standard set for the grade).

PROBLEM-SOLVING—END OF GRADE 3

*"Problem-solving is the **focus** of mathematics at all grade levels" (**Western Framework**, p. 8).*

General Outcomes

By the end of Grade 3, students will

- begin to develop and apply strategies to solve a wide variety of problems
- demonstrate an interest in verifying results with respect to the original problem
- begin to use problem-solving approaches to investigate and understand mathematical content
- sometimes formulate problems from everyday and mathematical situations
- show a growing confidence in ability to use mathematics meaningfully

Specific Outcomes

More specifically, the student can

- solve problems with growing confidence
- try new ideas and pursue solutions in problem-solving activities
- develop and apply simple problem-solving strategies
- independently verify results of problem-solving
- use cooperative skills in group problem-solving activities

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STANDARDS OF PERFORMANCE

LEVEL 1

Characteristics of Student Performance

The student can solve simple word problems, but requires assistance to carry through problem-solving processes for multi-step and non-traditional problems. The student does some contributing to group problem-solving, requiring support and encouragement to persevere and to become a risk-taker.

Sample Performance Indicators

More specifically, the student can

- create and solve simple 1-step arithmetic problems
- solve, with assistance and materials, 2-step problems and problems involving 2- and 3-digit numbers
- with assistance, choose a strategy, make a prediction or an estimation, and record the process used to solve problems
- contribute to group problem-solving by cooperating, making guesses, using materials and pictures, and trying, when encouraged, to explain processes and results

157

STANDARDS OF PERFORMANCE

LEVEL 2

The student understands the problem and is able to draw from a variety of strategies to solve problems. The student develops a plan and carries it out in arriving at the solution(s). The student solves the problem, and verifies and communicates the solution. The student works cooperatively and independently. The student is willing to take risks and pursues other options in solving problems.

More specifically, the student can

- demonstrate an understanding of the problem by identifying key information and questions, and predict a solution(s)
- develop a plan and carry it out
- determine an appropriate solution
- verify the solution
- pursue other options, with assistance
- share and communicate method(s) and solution(s)
- create problems (1 and 2 step) from everyday and mathematical situations
- work cooperatively, and make a significant contribution to the group

LEVEL 3

The student independently identifies the relationships between and among known and unknown information in problem situations, and justifies strategies used and solutions found during the problem-solving process. The student is self-motivated to identify problems of interest in real-world contexts, and to persist until satisfactory solutions are found. The student is willing to communicate problem-solving processes and results in a variety of ways.

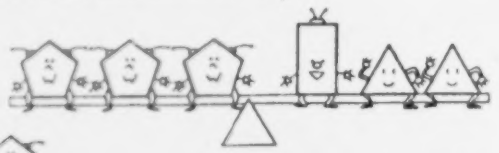
More specifically, the student can

- confidently approach problems, taking risks, and persevering until satisfied with the results
- use various processes (e.g., visualization, determine part-whole number relationships, etc.) to analyze problems and tasks, and to determine the relationships between the question or task and the information provided
- recognize that different strategies may be used, and justify the choice(s) made in the problem-solving process
- seek connections between new and previous problems
- independently make and communicate (in various ways) predictions, methods, options, solutions, and verifications
- create and solve problems from everyday and mathematical situations
- make significant contributions to group problem-solving, demonstrating attention to accuracy, thoroughness, persistence, and creativity

PROBLEM-SOLVING—END OF GRADE 3

Sample Assessment Activities

1. **Rules:**
   Balance the seesaw.
   Robots that are the same have the same weight.
   Robots that are different have different weights.
   All robots weigh more than zero kilograms.



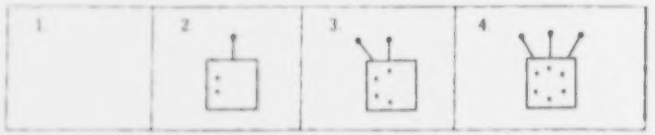
If on the seesaw weighs 5 kilograms, what could the other robots weigh?

Give more than one possibility.
Explain how you found your answers.

2. Donnie has to climb 10 steps to reach his bedroom door.
   He climbed up 7 steps and went down 3.
   He then climbed 4 more steps and went down 6.
   How many steps must he now climb to reach his bedroom door?

   Show how you found the answer.

3. Look at the following picture pattern.



What would you predict picture 1 to look like?

Explain how you arrived at this decision.

Illustrative Responses from Manitoba Grade 3 Students

STANDARDS OF PERFORMANCE

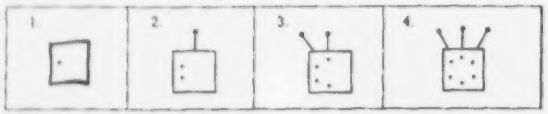
LEVEL 1

1. 5 kg 5 kg

well those 3 hexagons each of them is 5 kilograms. 3x5=15 so to balance the seesaw it has to be equal.

2. 2

7-3=4+4=8-6=2

3. 

I made a box and put 1 dot in it because the other one has a stick and 2 dots so I put ⚀.

STANDARDS OF PERFORMANCE

LEVEL 2

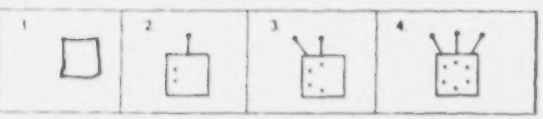
1. 3 kg — 9 kg

6 kg — 3 kg

Because 5+5+5= 15 kg so 6+6+3=15 kg + 15 kg are on one side + 15 kg are on the other side. Because 5+5+5=15 kg and 9+3+3= 15 kg and there is 15 kg on one side + 15 kg on the other side.

2. He must climb 8 more

1 3 4 5 6 7 8 9 10



This + 2 dot + 1 antenae until you reach that ← that

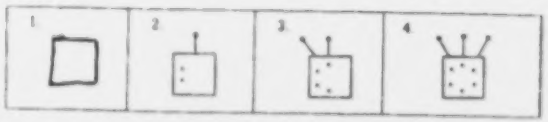
LEVEL 3

1. 13 kg — 11, 9

1 kg — 2, 3

The big robot will always weigh an odd number. The little robots will weigh an even or odd.

2. 7-3+4-6+(8)=10

3. 

Every time you add 1 antennae and two dots so take away 1 antennae and two dots from picture number two.

Problem-Solving

PATTERNS AND RELATIONS—END OF GRADE 3

"Use patterns to describe the world and to solve problems."

General Outcomes

By the end of Grade 3, students will

- investigate, establish, and communicate rules for non-numerical and numerical patterns, including those found in the home, and use these rules to make predictions

Specific Outcomes

More specifically, students will

- sort, concretely and pictorially, using two or more attributes
- use objects and concrete models to explain the rule for a pattern, such as those found on addition and multiplication charts
- make predictions based on addition and multiplication patterns

(*PR-I.3.1* to *PR-III.3.1*)

STANDARDS OF PERFORMANCE

LEVEL 1

Characteristics of Student Performance

The student sorts materials, pictures, and numbers by one and two attributes. The student recognizes, continues, creates, and describes repeating visual, auditory, and kinesthetic patterns. The student represents basic number relationships using materials and pictures.

Sample Performance Indicators

More specifically, the student can

— identify similarities between 2 objects, pictures, patterns, etc.
— sort, classify, and compare structured collections independently, and unstructured collections with assistance
— make attempts to record sorting and classifying, using diagrams and graphs

— recognize various patterns in the environment
— describe and translate concrete and pictorial repeating patterns in more than one way
— use materials to continue simple growing patterns, and draw and describe a growing pattern, with assistance
— supply missing numbers in patterns and grids, use materials or pictures to justify thinking

— use materials to represent the relationship between 2 numbers, and recognize symbols that denote mathematical relationships (<, ≠, =, >, +, −, and x)

STANDARDS OF PERFORMANCE

LEVEL 2

The student sorts and classifies, using 2 or more attributes. The student identifies, completes, describes, and creates non-numerical and numerical repeating and growing patterns. The student use patterns and basic number-fact relationships to solve problems.

More specifically, the student can

— identify similarities and differences in objects, pictures, patterns, and numbers
— sort and classify structured and unstructured materials and number collections, using own and predetermined rules
— record sorting and classifying using diagrams and graphs

— identify, supply missing elements, create, describe in more than one way, and correct errors in concrete, pictorial, and symbolic repeating patterns (ABC, ABC, ABC....)
— recognize, continue, or supply missing numbers in skip-counting or growing patterns involving simple addition, and orally describe the pattern or justify solutions
— identify, act out/model, and orally describe patterns visible on the hundred, addition, and multiplication (7 by 7) charts
— use patterning as a strategy for solving problems in mathematics

— recognize and use known relationships to determine an unknown fact; (e.g., 3 sets of 7 = ❑ ; 2 sets of 7 is 14, so 3 sets of 7 is 14 + 7 or 21)
— use, with assistance, the relationships between addition and subtraction, and between multiplication and division when solving whole-number problems

LEVEL 3

The student independently uses sorting and classifying to organize information. The student independently displays a highly developed sense for identifying and using patterns and known relationships to learn about mathematics, and to solve problems.

More specifically, the student can

— sort and re-sort, classify and re-classify, and compare the results for the same structured or unstructured collection, noting similarities and differences, exceptions, and exclusions, etc.
— describe attributes and classification rules for own or pre-sorted collections, attempting to use concise and precise language
— justify placement of additional items into existing collections
— record sorting and classifying, using a variety of diagrams and graphs, and interpret the recordings of others

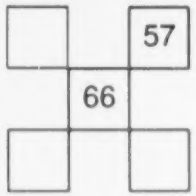
— recognize, continue, and supply missing elements in non-numerical and numerical growing patterns, using materials, pictures, and symbols
— use materials, drawings, and everyday language to create growing patterns, and to justify decisions
— search for patterns, and use patterning as a strategy for solving problems in other mathematics strands or subject areas, and in real life

— recognize and apply an understanding of the relationships between addition and subtraction, addition and multiplication, etc., when solving whole-number problems

PATTERNS AND RELATIONS—END OF GRADE 3

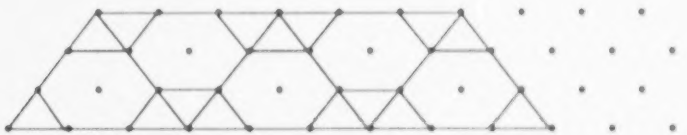
Sample Assessment Activities

1. This is a piece cut from a hundred chart. Fill in the missing numbers.



Tell how you decided what numbers to put in each box.

2. Continue this pattern.



Tell what you noticed about this pattern. How did this help you to continue the pattern?

3. Complete the pattern and then write the next line of the pattern. Describe the patterns you see.

1 + 3 = _____

3 + 5 = _____

5 + 7 = _____

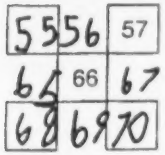
___ + ___ = _____

STANDARDS OF PERFORMANCE

LEVEL 1

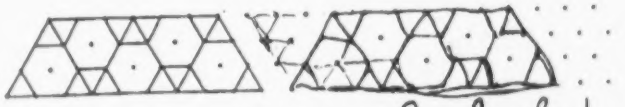
Illustrative Responses from Manitoba Grade 3 Students

1.



cant 55 to 70 you can all you hafe to do is put in the Boxs

2.



I looked at the other one and I coped it.

3.

1 + 3 = 4

3 + 5 = 8

5 + 7 = 12

9+6= 16

It coned By 4

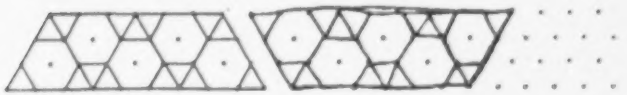
STANDARDS OF PERFORMANCE

LEVEL 2

1.

55		57
	66	
75		77

I looked for patterns going down and decided what numbers would fit.

2. 

Tell what helped you to continue this pattern. it turned upside down, + also the shapes (hexagon + triangle).

3.

1 + 3 = 4
3 + 5 = 8
5 + 7 = 12
7 + 9 = 16

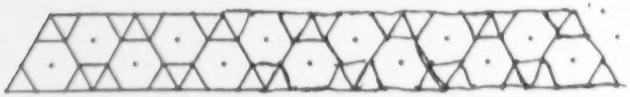
1,3,5+2=7 7 comes next
3,5,7+2=9 9 comes next

LEVEL 3

1.

55	56	57
65	66	67
75	76	77

55+11+11=77
57+9+9=75 65+1+1=67 56+10+10=76

2. 

Tell what helped you to continue this pattern. I Looked at the tryangles in the example. Says "the tiny triangles turn upside down + there's a hexagon inside each one"

3.

1 + 3 = 4
3 + 5 = 8
5 + 7 = 12
7 + 9 = 16

1357 and 3579 and 4 8 12 16 The questions are odd and the answers go by 4s

STATISTICS AND PROBABILITY (DATA MANAGEMENT)—END OF GRADE 3

General Outcomes

"Collect, display and analyze data to make predictions about a population."

By the end of Grade 3, students will

- collect first and second-hand data, be able to display the results in more than one way, and interpret the data to make predictions
- use simple probability experiments, designed by others, to explain outcomes

Specific Outcomes

More specifically, students will

- collect data, using printed material and measuring/technological resources
- display data, using rank ordering
- display the same data in more than one way
- make predictions and inferences when solving problems
- obtain new information by performing arithmetic operations on the data
- describe the likelihood of an outcome, using such terms as likely, less likely, chance
- conduct a probability experiment, choose an appropriate recording method, and draw conclusions from the results

(*SP-I.3.1* to *SP-V.3.2*)

STANDARDS OF PERFORMANCE

LEVEL 1

Characteristics of Student Performance

The student, with assistance, collects, organizes, and displays information. The student reads tables, etc., and the information visible on concrete, pictorial, and bar graphs organized on a 1:1 scale. The student uses everyday language to make predictions based on personal experiences, and carries out given probability experiments.

Sample Performance Indicators

More specifically, the student can

— make a prediction of the outcome

— collect and organize materials, and display the results (using 1:1 relationship) on concrete and pictorial graphs, or sorting diagrams

— complete partially constructed tables or graphs (e.g., fill in the frequency totals for a tally chart; label a graph; etc.)

— answer specific questions about the information shown on concrete, pictorial, and bar graphs, (1:1 scale) and sorting diagrams

— carry out, with assistance, simple probability experiments

— use the everyday language of chance to make a prediction based on personal experiences (e.g., always, often, sometimes, hardly ever, never, probably, likely, unlikely)

STANDARDS OF PERFORMANCE

LEVEL 2

The student collects, organizes, displays, and describes data in a variety of ways. The student interprets the data, and makes reasonable predictions and inferences based on the data. The student uses the language of chance to describe the likelihood of events, and carries out simple experiments to determine outcomes.

More specifically, the student can

— formulate a question (independently/cooperatively)
— make a prediction of the outcome
— determine what data needs to be collected, where, and how to do so
— collect data (independently/cooperatively)
— sort and classify
— describe data collected and techniques used in collecting
— display data using appropriate labels and titles
— interpret representations of data including graphs with 1:1, 1:2, 1:5, and 1:10 scales
— perform arithmetic operations on the data to create new information, and verify the calculations
— make comparisons
— draw and justify conclusions

— carry out probability experiments
— record experimental results
— describe results, using the language of probability (likely, unlikely, certain, uncertain, probable, not probable)

LEVEL 3

The student designs and conducts data management activities to find answers to curricular or personal questions. The student organizes and displays the same data in a variety of ways. The student draws conclusions and makes predictions based on data, and uses the language of chance to predict the outcomes of events.

More specifically, the student can

— formulate questions, and use a variety of methods to collect and organize first and second-hand information
— construct and label charts and graphs, and evaluate the suitability of different charts and graphs for displaying the same information
— draw conclusions and make predictions from displayed information
— apply arithmetic operations to data, and use the results to support predictions or to formulate new questions

— design games or experiments using concepts of chance, and use the language of probability to describe results or make predictions

STATISTICS AND PROBABILITY (DATA MANAGEMENT)—END OF GRADE 3

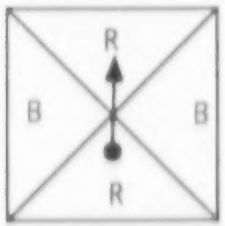
Sample Assessment Activities

1. Mrs. Smith has 23 students in her Grade 3 class. Before their swimming classes started the students wanted to know how many students were at each swimming level. These are the data they collected.

yellow	//	orange	~~////~~ /	red	////
maroon	~~////~~ //	blue	//	green	/

Make and label a graph to display this information. **Remember to include all the necessary parts of a graph!**
Write 3 questions about your graph that you could ask a friend.

2. Look at the picture below. It shows a spinner that might be used in a game. The chances of landing on RED when using this spinner are 2 out of 4, or $\frac{1}{2}$, or fifty/fifty.



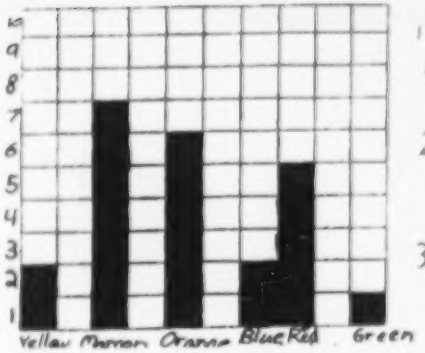
Design a different spinner that would still give RED a fifty/fifty chance. Write down your reasons for your design.
Discuss your solution and reasons with your partner (group). If you have time, design other spinners showing different probabilities. Label them. Use the space below to do your work.

Illustrative Responses from Manitoba Grade 3 Students

STANDARDS OF PERFORMANCE

LEVEL 1

1.

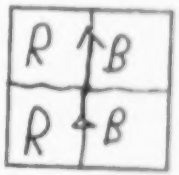


1 Witch is the buggest Number?

2 Witch is the smallest Number?

3 what is the graph about?

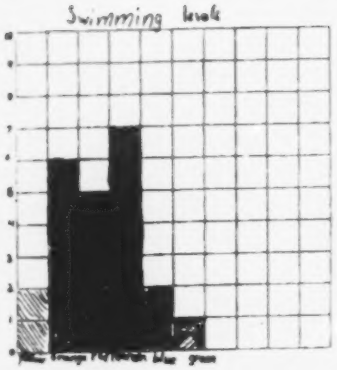
2.



line if you turn it because it starts on the and you should get fifty fifty it will go around what speed it goes. Depend on

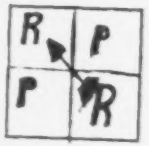
STANDARDS OF PERFORMANCE

LEVEL 2

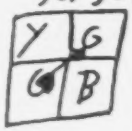
1. 

1. How many students are in green & maroon?
2. How many students in all?
3. How many colors?

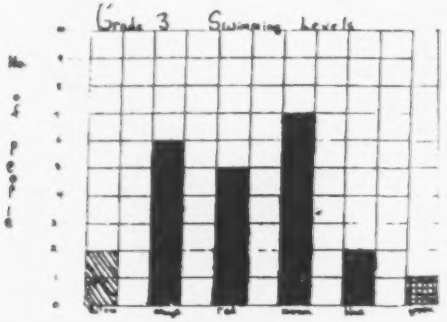
2. I think that this spinner has 50/50 chance because it has 2 reds and 2 greens and 4 spaces.



50/50 chance of green because there are two greens and the spinner is on them.

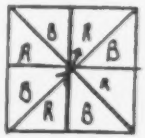


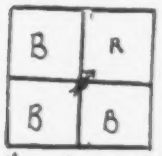
LEVEL 3

1. 

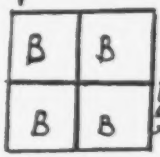
1. How many kids took swimming lessons? What strategy did you use?
2. How many kids are in maroon? How do you know?
3. How many kids in blue and yellow together? How do you know?

2. I think it will still be fifty fifty because half is red and half is blue.





25p.



This is not fifty/fifty because there are 4 blue and no red.

this is not fifty/fifty because there are more blue than red.

SHAPE AND SPACE (MEASUREMENT)— END OF GRADE 3

General Outcomes

"Describe and compare everyday phenomena, using either direct or indirect measurement."

By the end of Grade 3, students will

- estimate, measure, and compare, using whole numbers and primarily standard units of measure

Specific Outcomes

More specifically, students will

- estimate, measure, record, compare, and order objects by length, height, and perimeter using non-standard and standard units
- select the most appropriate unit, including km, to measure length, and describe the relationships among cm, dm, and m
- select an appropriate non-standard unit to estimate, measure, record, compare, and order shapes by area
- construct a variety of shapes given a specific area in non-standard units
- select an appropriate non-standard unit, or litres, to estimate, measure, record, compare, and order containers by volume/capacity
- use non-standard and standard units (g, kg) to estimate, measure, record, compare, and order objects by mass, and construct objects to equal a given mass
- estimate the passage of time, using standard units (seconds, minutes, hours, days, months, years), and relate days to years
- read and write the days of the week and the months of the year
- read digital clocks, and write time to the nearest minute, using 12-hour notation
- estimate, read, and record temperature to the nearest degree, and relate temperature to everyday situations
- estimate, count, and record collections of coins and bills
- determine the amount of change from a purchase

(*SS-I.3.1* to *SS-VIII.3.4*)

STANDARDS OF PERFORMANCE

LEVEL1

Characteristics of Student Performance

The student selects, sometimes independently, appropriate non-standard and standard SI units to estimate and measure the length, mass, or capacity of objects, and uses the results to describe and compare objects. The student, with assistance, uses concrete references to estimate the results of measurements, and compares estimates with actual measurements.

Sample Performance Indicators

More specifically, the student can

— recognize which measurement tool(s) is used for length, mass, volume/capacity, time, and temperature, and which unit will appropriately represent the attribute that is measured

— estimate, measure, record, compare, and order, with assistance, linear attributes, area, capacity, and mass of shapes and objects in the learning environment

— correctly use comparative language (heavier and heaviest, etc.)

— read and write time to the hour and half hour (digital clock)

— read and record temperature on a Celsius thermometer

— recognize coins and bills to $10, and make change to $1 using various combinations of coins

STANDARDS OF PERFORMANCE

LEVEL 2

The student estimates in all modes of measurement (linear, volume/capacity, mass/weight, time, temperature, and money) using non-standard and standard SI units, recognizing when estimates are appropriate. The student performs actual measurements in each mode, recording in appropriate units. The student orders, compares, and describes relationships between and among measurements.

More specifically, the student can

— select the most appropriate unit and justify the choice
— estimate and measure, using non-standard units
— estimate and measure, in standard SI units
  - linear distance (cm, dm, m and km)
  - volume/capacity (litres)
  - mass/weight (g, kg)
  - temperature (degrees Celsius)
— record, compare, and order measurements
— recognize and describe the relationships between and among the respective SI units (e.g., 1m = 10 dm; 100 cm)

— construct or draw
  - a variety of shapes with a specific area
  - a variety of right angle shapes with a specific perimeter
  - specified lengths (cm, dm)

— estimate the passage of time in minutes and seconds
— read and write time, using digital and analog (12 hour) clocks (hours and half hours, minutes past the hour)
— relate hours to days, days to weeks, weeks to years, months to years

— read and record temperature, in degrees Celsius, using a thermometer

— estimate, count, and record collections of coins and bills up to $10
— recognize bills up to $100
— represent a given value of money in a variety of ways (25¢ = 10¢ + 10¢ + 5¢; 25 pennies; 5 nickels; etc.)
— make change up to $10
— read and write both money notations ($0.89 and 89¢)

LEVEL 3

The student applies an understanding of measurement systems in all subject areas, and in real life. The student estimates effectively, uses relationships among standard (SI) units to rename measurements, and applies observed patterns to simplify the calculation of perimeter, area, and volume.

More specifically, the student can

— estimate, with a high degree of accuracy, and justify measurement
— explain and apply the relationships among standard SI units, including the conversion of mm to m and vice-versa, etc., and relate the metric system to the base 10 place-value system

— draw or construct lines and construct shapes and prisms according to given or self-determined measurements
— discover and use rules to find perimeter, area, and volume to solve own and given problems

— read digital and analog clocks and write time to seconds
— use past experiences to estimate the time needed for new experiences, and apply knowledge of time relationships (minutes to hours, hours to days, etc.) to solve problems

— create and solve multi-step problems involving purchases and change up to $100

SHAPE AND SPACE (MEASUREMENT)—END OF GRADE 3

Sample Assessment Activities

1. Explain what area is. _____

_____

Use rubber bands to make 8 different shapes, each with an area of 4 squares on the geoboard. Record all the shapes you make onto the dot-paper squares below.

2. Imagine you collected this money from a popcorn sale. Spread out the coins you find in your bag. Tell, without counting, about how much money you think there is. _____

Count the money. The amount is _____ ($8.20)
Describe how you went about counting the money.

_____

_____

_____

The money in the bag was in coins only. How could you have this same amount of money using bills and as few coins as needed. To answer, draw and label or describe in words.

3. Tell what you know about how centimetres, metres, and decimetres relate or connect to each other.

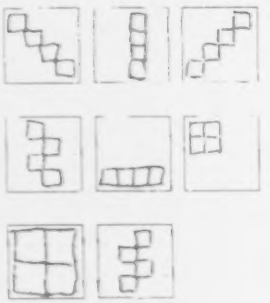
_____

_____

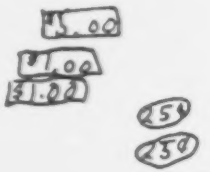
STANDARDS OF PERFORMANCE

LEVEL1

1. a space that someone owns, _____



2. $6.00
$7.50
I sorted the pennies 1 group, nickles in another, dimes in 1, quarters in 1, loonies in one then I counted them

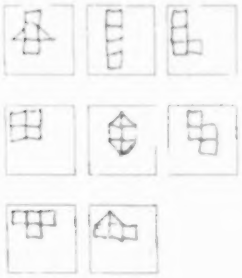


3. They are all used to measure things.

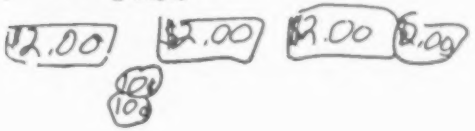
STANDARDS OF PERFORMANCE

LEVEL 2

1. It is the space inside something



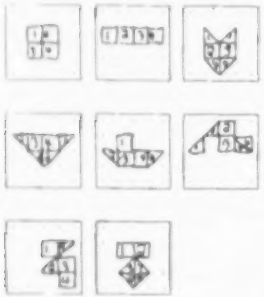
2. 10.00
$8.30
by loonies, then quarters, 10¢, 5¢ and 1¢
pennies. 30¢
nickles = 1.00
loonies = $3.00
quarters = $1.75
dimes = $2.10



3. metres are more then cm theye all are mesering units

LEVEL 3

1. ~~are~~ ~~word~~ how much space is coverd.



2. $4.50
$3.00
d found $'s. ex (10 10¢, 20 5¢, 4 25¢ and 4 loonies. Then d counted up the rest.
d found $8.00 and 20¢ left over.
on $5.00 bill one $2.00 bill one Loonie $1.00 $2.00
2-10¢.
10 6¢

3. They all have the word metre in them There are 100 cm. in a metre. There are 10 cm. in a dm. All of them are a unit of mesuring.

SHAPE AND SPACE—END OF GRADE 3— (3-D, 2-D, AND TRANSFORMATIONAL GEOMETRY)

General Outcomes

"Describe the characteristics of 3-D objects and 2-D shapes, and analyze the relations among them."
"Perform, analyze and create transformations."

By the end of Grade 3, students will

- describe, classify, construct, and relate 3-D objects and 2-D shapes
- use numbers and direction words to describe the relative positions of objects in one dimension, using everyday contexts

Specific Outcomes

More specifically, students will

- identify and count faces, vertices, and edges of 3-D objects
- identify and name faces of a 3-D object with appropriate 2-D names
- describe pyramids and prisms by the shape of the base
- demonstrate that a rectangular solid has more than one net
- compare and contrast two 3-D objects
- recognize congruent (identical) 3-D objects and 2-D shapes
- explore, concretely, the concepts of perpendicular, parallel, and intersecting lines in 3-D objects
- communicate and apply the terms of direction, such as north or south, and relate to maps
- graph whole number points on a horizontal or vertical number line
- trace a path, using oral or written instructions

(*SS-IX.3.1* to *SS-XII.3.2*)

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STANDARDS OF PERFORMANCE

LEVEL 1

Characteristics of Student Performance

The student uses everyday language, and geometric language with assistance, to name, describe, and compare 3-D objects and 2-D shapes. The student uses concrete objects and paper to construct 3-D objects and 2-D shapes, and connects these objects and shapes to real-world things.

Sample Performance Indicators

More specifically, the student can

— associate 3-D objects and 2-D shapes with geometric names

— independently sort and classify objects and shapes by simple properties (colour, number of sides, rolls, etc.) and by geometric properties with assistance (parallel lines, number of vertices, square prisms, etc.)

— describe and compare 3-D objects and 2-D shapes using at least one property

— use basic 2-D shapes and 3-D objects to build repeating patterns, and describe the patterning rule(s)

— use materials or nets to solve simple construction problems and puzzles

— use informal geometric terms (up, down, left, right, etc.) and numbers to describe positions of objects in space

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STANDARDS OF PERFORMANCE

LEVEL 2

The student describes, classifies, constructs, and relates 3-D objects and 2-D shapes, and their positioning in space. The student uses correct terminology to describe the properties and relationships of 3-D objects and 2-D shapes including concepts of congruence, parallelism, perpendicularity, and symmetry. The student displays an awareness of geometric ideas in his/her environment.

More specifically, the student can

— identify, name, classify, describe, and relate concrete 3-D objects to skeletons, nets, and pictorial representations

— compare and contrast 3-D objects and 2-D shapes using 2 properties (example: edges and faces)

— create 2- and 3-dimensional patterns using at least 2 criteria (example: shape and orientation)

— build skeletons of 3-D objects and construct objects from their nets

— identify, name, and construct polygons (up to 8 sides)

— show congruency of objects and shapes by superimposing (covering), folding, and measuring

— demonstrate concretely, and represent parallel, perpendicular, and intersecting lines

— describe locations including directions on a map, grid, or line

— graph whole-number points on a horizontal or vertical number line (coordinates)

— create and follow a path using oral and/or written direction(s)

— use a variety of strategies to solve geometric problems

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LEVEL 3

The student uses accurate geometric language to describe the properties of real-world objects and shapes, and to explain shape and position relationships. The student uses tools and technology to create various shapes and maps with given or self-determined directions.

More specifically, the student can

— confidently use geometric language orally to name, describe, and relate the properties of objects and shapes

— identify and describe, without prompting, geometric objects and shapes within other objects or shapes and nature

— build complex structures and shapes, and predict the results of making changes to constructions

— use available technology (example: Logo) to demonstrate an understanding of the properties of shapes, to create figures using combinations of shapes, and to give directions for moving through space

— draw maps showing known areas, and provide oral or written directions for moving and locating objects on maps or grids (coordinate points)

— with assistance, explain a strategy for proving all possible solutions for a geometric construction problem

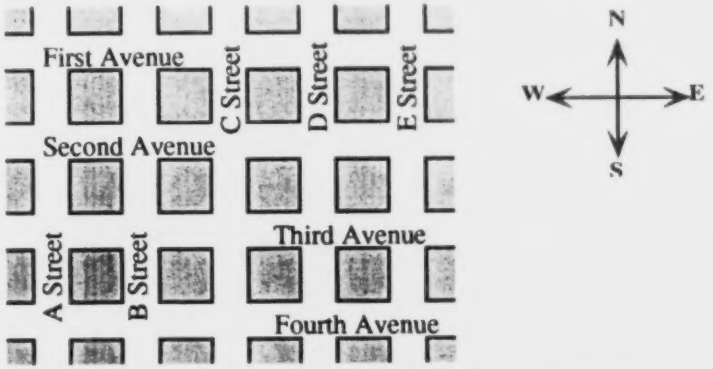
SHAPE AND SPACE—END OF GRADE 3—
(3-D, 2-D, AND TRANSFORMATIONAL GEOMETRY)

Sample Assessment Activities

1. Which two shapes are the same? Explain your thinking.

2. In what 3 ways are these objects the same? Name 3 differences between these objects.

3. The map shows some of the streets in a city
Peter was on the corner of Second Avenue and C Street. He walked 1 block north, 1 block east, 3 blocks south, and 2 blocks west.
Where is he now?



STANDARDS OF PERFORMANCE

LEVEL 1

Illustrative Responses from Manitoba Grade 3 Students

1. I think that B and D are the Same. Because they look the Same

2. Same
1. They both have a Sharp poynt.
2 They both have a Straight bodem.
3 They both allmost have the same Side.
1 Different
2 They both have different names.
3 One taller than the other
Idea: is standing up and the other is siting down.

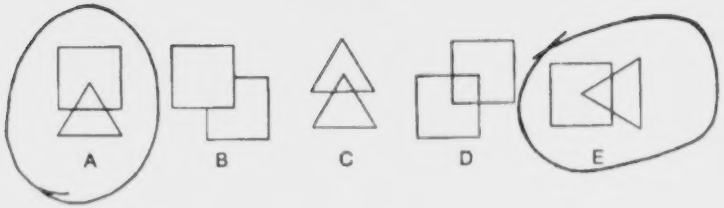
3.

B Street.

STANDARDS OF PERFORMANCE

LEVEL 2

1.



2.

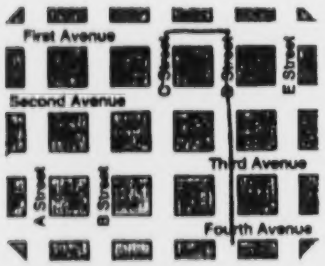
Same

1. both have a Square
2. both have more than 3 Points
3. They both have more than 4 faces

Difrent

1. The Pyrimid has 5 Points
2. The Prism has 6 face
3. The Pyramid has 8 edges

3.

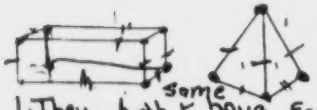


Fourth Avenue

LEVEL 3

1. A + E both have a Squre and triangle E has just bean trunc

2.

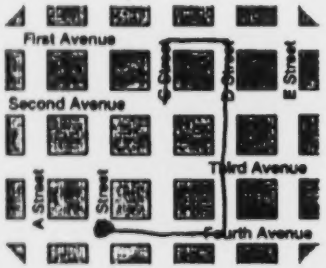


1. They both have Faces.
2. They both have edges.
3. they both have corners.

different

1. the Squar Pyramid has 5 Faces the other has 6.
2. the squar Pyramid has 8 edges the other has 11.
3. The Squar Pyramid has (5) corners. And the other has (8).

3.



On the corner of fourth avenue and B street

NUMBER (CONCEPTS)—END OF GRADE 3

General Outcomes

"Use numbers to describe quantities."
"Represent numbers in multiple ways."

By the end of Grade 3, students will

Specific Outcomes

- develop a number sense for whole numbers 0 to 1000, and explore fractions (fifths and tenths)

More specifically, students will

- count forward by 2s, 5s, 10s, and 100s to 1000, using random starting points, and backward by 2s, 5s, 10s, 25s, and 100s using starting points that are multiples of these numbers
- read and write numerals to 1000, read and write number words to 100, and use ordinal numbers to 100
- recognize, build, compare, and order sets containing 0 to 1000 elements
- represent and describe numbers to 1000 in a variety of ways
- recognize and explain if a number is divisible by 2, 5, or 10
- demonstrate, concretely and symbolically, place-value concepts to give meaning to numbers to 1000
- round numbers to the nearest 100
- estimate, then count the number of objects in a set (0-1000), and compare the estimate with the actual count
- illustrate and explain halves, thirds, fourths, fifths, and tenths as part of a region or a set

(***N-I.3.1*** to ***N-II.3.1***)

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STANDARDS OF PERFORMANCE

LEVEL 1

Characteristics of Student Performance

The student counts, represents, and names 2 digit numbers, but has limited understanding of counting and place-value concepts past 100. The student recognizes and names unit fractions of a region. (1/2, 1/3, 1/4, 1/5, and 1/10).

Sample Performance Indicators

More specifically, the student can

- demonstrate an understanding of conservation of number
- rote count to 1000, and skip-count forward and backward by 2, 5, and 10 to 100, using multiples as starting points
- recognize, read, write, and order numerals to 100, and name numbers to 100 as odd or even
- read and write number words to 20, and use ordinal numbers to 31
- represent and rename numbers to 100, using different modes (materials, pictures, and symbols) and different combinations (25 = 20 + 5; 10 + 10 + 5; 13 + 12; etc.)
- count, compare, and order sets to 100
- use symbols to express relationships between numbers to 100 (<, >, =, ≠)
- use place-value concepts, with assistance, to rename and compare numbers beyond 100
- round to the nearest multiple of 10
- estimate quantity to 100 using a referent
- recognize halves, thirds, fourths, fifths, and tenths and portion shapes to show these fractions

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STANDARDS OF PERFORMANCE

LEVEL 2

The student represents, regroups, and renames numbers. The student understands the characteristics of numbers, (odd/even, divisibility), and uses place-value concepts when ordering, representing, and rounding numbers. The student recognizes and names fractional parts of regions and sets. The student uses number concepts in a variety of meaningful contexts.

More specifically, the student can

— recognize, count, read, write, and order numbers to 1000
— read and write number words to 100
— use ordinal numbers to 100
— skip-count forward and backward by 2, 5, 10, and 100 from random starting points
— skip-count by 3, 4, and 25, using multiples as starting points
— represent and describe numbers to 1000 in a variety of ways:
- 18 = 9 + 9; 2 x 9 ; 10 + 8 ; 20 - 2 ; 14 + 4 ; etc.
- odd/even
- divisible by 2, 5, or 10
- <, >, =, ≠

— demonstrate and use place-value concepts to represent numbers concretely, pictorially, and symbolically (words and numerals), using
- renaming; e.g., 320 = 32 tens; 320 ones
- expressing numerals in both standard and expanded form (e.g., 320 = 300 + 20 + 0)

H	T	O
0	32	0

— round to nearest multiples of 10 and 100s
— estimate, count, compare, and order sets of objects to 1000, using a variety of strategies

— recognize, name, and demonstrate halves, thirds, fourths, fifths, and tenths of regions and sets

LEVEL 3

The student demonstrates an intuitive sense for numbers beyond 1000. The student demonstrates and applies an understanding of place-value concepts and number relationships to compare, order, estimate, and calculate. The student recognizes, names, and demonstrates fractions of regions and sets.

More specifically, the student can

— demonstrate and explain counting in systems other than base 10 (e.g., base 3, base 4, etc.)

— demonstrate and explain the relationships among counting, renaming, and place-value concepts
— apply multiples of 10 to explain place-value beyond 1000

— use number characteristics, number relationships, and place-value concepts to justify and explain estimation, rounding, and mental calculation strategies and solutions

— name and represent equivalent fractions of a region

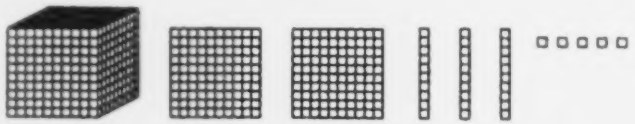
NUMBER (CONCEPTS)—END OF GRADE 3

Sample Assessment Activities

1. Solve the following riddle.
   I am greater than 15.
   I am less than 22.
   I am an odd number.
   I can be divided evenly by 3.
   What number am I?_____
   How did you get your answer?

2. In June, Marcus will play a tennis game every third day, beginning June 3. He will play a baseball game every ninth day, beginning June 9. On what dates in June will he play both a tennis game and a baseball game?

3. Describe 3 other numbers you could show if you trade the flats for 2 different base ten blocks.



STANDARDS OF PERFORMANCE

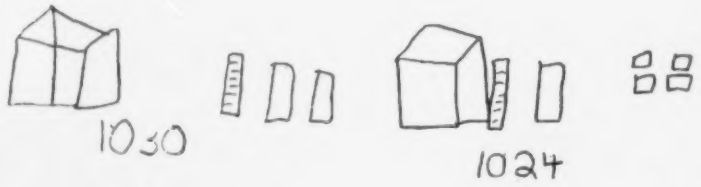
LEVEL 1

Illustrative Responses from Manitoba Grade 3 Students

1. 18

   18 because 18÷3=6

2. June 9

3. 

STANDARDS OF PERFORMANCE

LEVEL 2

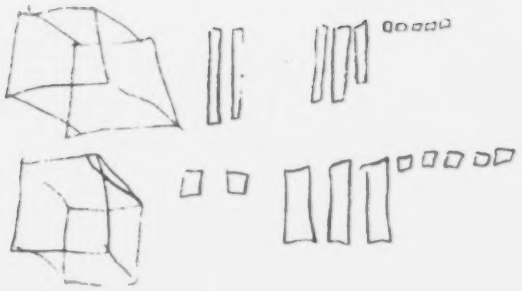
1. 21

~~16~~ ~~17~~ ~~18~~ ~~19~~ ~~20~~ 21

21 ÷ 3 = 7

2. wensday and thorsday
tennis 3 6 9 12 15 18 21 24 27 30
Base Ball 9 12 36

3.



202

LEVEL 3

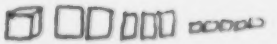
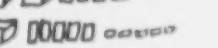
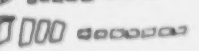
1. 21

I divided every ~~every~~ odd number between 15 & 22.
17 ÷ 3 = 5R2, 19 ÷ 3 = 6R1, 21 ÷ 3 = 7
answer

2. 9th 18th 27th ~~36th~~

T	B
3	9
6	18
9	27
12	36
15	45
18	54
21	63
24	72
27	81
30	90
33	99
36	108
39	117
	126
	135

3.

thousands	hundreds	tens	ones	
1	2	3	5	
2	0	4	5	
1	0	5	5	
1	0	3	7	

Number

203

NUMBER (OPERATIONS)—END OF GRADE 3

General Outcomes

"Demonstrate an understanding of and proficiency with calculations."
"Decide which arithmetic operation(s) can be used to solve a problem, and then solve the problem."

Specific Outcomes

By the end of Grade 3, students will

- apply an arithmetic operation (addition, subtraction, multiplication or division) on whole numbers, and illustrate its use in creating and solving problems
- use and justify an appropriate calculation strategy or device to solve problems

More specifically, students will

- use manipulatives, diagrams, and symbols, in a problem-solving context, to demonstrate and describe the process of addition and subtraction to 1000, and the process of multiplication and division with products and dividends to 50
- recall addition and subtraction facts to 18, and multiplication and division facts to 49 (7 x 7)
- verify solutions to addition and subtraction problems, using estimation, calculators, and inverse operations
- justify the choice of method for addition and subtraction from among estimation or mental mathematics strategies, manipulatives, algorithms, or calculators
- calculate products and quotients, using estimation and mental mathematics strategies

(*N-V.3.1* to *N-VI.3.1*)

STANDARDS OF PERFORMANCE

LEVEL 1

Characteristics of Student Performance

The student recalls and applies basic addition, subtraction, and multiplication facts to simple problem situations. The student relies on visual representations, and assistance, to apply addition and subtraction operations to problems involving 2- and 3-digit numbers.

Sample Performance Indicators

More specifically, the student can

— recall basic addition and subtraction facts to 18, and multiplication facts to 25
— use real or concrete materials and pictures in conjunction with symbols to represent and solve problems involving addition and subtraction of 2- and 3-digit numbers
— demonstrate multiplication as repeated addition, and division as repeated subtraction or as sharing equally, and model solutions to problems involving these operations
— estimate, or calculate mentally, with assistance, addition and subtraction of 2-digit numbers, using a given strategy
— apply the appropriate operation in a 1-step problem, verify the solution, and justify the choice of operation

STANDARDS OF PERFORMANCE

LEVEL 2

The student calculates, identifies and justifies the answers to addition, subtraction, multiplication, and division questions. The student applies these operations in problem-solving situations, verifying calculations and justifying strategies.

More specifically, the student can

— recall basic addition and subtraction facts to 18
— recall multiplication and division facts to 49
— use manipulatives, diagrams, and symbols in a problem-solving context to demonstrate and describe the process of addition and subtraction to 1000, and multiplication and division, with and without remainders, to 50
— use and explain a variety of strategies to aid in mental and paper-pencil calculations (rounding off; commutative property of addition; etc.)
— make reasonable estimates to computational questions using a variety of strategies
— apply the appropriate operation(s) in 1- or 2-step problems, verify solutions, and justify choice of operation(s)
— construct and solve problems that demonstrate the four basic operations
— recognize different types of problems (join, separate, part-part-whole, and comparisons) which require addition and subtraction to find a solution
— select an appropriate method of calculating (calculator, paper-pencil, metal mathematics)

LEVEL 3

The student verifies the solution(s) for single- or multi-step problems involving any operation(s), and justifies the solution(s) found or the methods applied during the problem-solving process. The student recognizes mathematical problems arising from real-world contexts, and pursues their solutions.

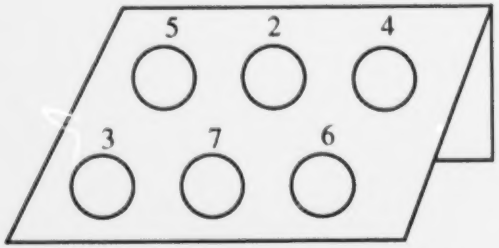
More specifically, the student can

— use part-whole analysis to describe number relationships and justify choice of operation(s) to solve different types of problems
— demonstrate different modes (concrete, pictorial, symbolic), methods (materials, paper-pencil, calculator, mental calculations), and strategies (front-end addition, counting on, making compatible numbers) for solving problems involving addition and subtraction of 3-or-more-digit numbers
— apply multiplication and division facts to solve problems
— justify methods used to solve problems, and use a variety of strategies (estimation, mental calculation, relationships among operations) to judge the reasonableness of answers
— recognize when an operation(s) can be used to answer real-world number problems, and apply a knowledge of operations

NUMBER (OPERATIONS)—END OF GRADE 3

Sample Assessment Activities

1. Five cages each have 4 monkeys and 5 gorillas in them.
   How many animals are there all together?
   Explain how you got your answer.

2. 

   How can you toss 3 beanbags to score 15 points?
   Give as many ways as you can.

3. The answer is 18. What is the story problem?

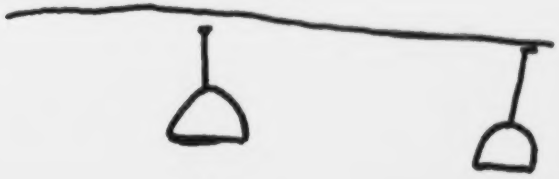
Illustrative Responses from Manitoba Grade 3 Students

STANDARDS OF PERFORMANCE

LEVEL 1

1. there are 22 animals
   I added

2. 1 beanbag is 5 points
   3X5=15
   15 is the answer.
   5X3=15 points

3. If their wher 12 people in a restaurant how many people out of 12 would you youse get the answer 6- 18?
   

STANDARDS OF PERFORMANCE

LEVEL 2

1. 45

I got my answer by adding 45÷9. If there are 9 in each cage and 5 cages. You times 9×5=45.

2. 1. 5+4+6=15 points 4. 5+5+5=15 points
2. 5+3+7=15 points 5. 3+3+3+3+3=15 points
3. 7+6+2=15 points

3. Mary has 9 cents. She loses 5 cents, earned 3 cents, finds 6 cents, loses 2 cents and her grandmother gave her 7 cents. How much money does Mary have?

LEVEL 3

1. 45

First I found 9 to ten and counted by tens to 50 took away Five and came out with 45.

2. I threw them in the 6 hole 3 times 5+5+5=15
2 threw 2 in the 6 hole and 1 in the 3 hole 6+6+3=15
3 throw 1 in the 7, 6, and 2 7+6+2=15
1. 4+7+4=15
2. 3+5+5=15
3. 5+3+7=15
4. 3+6+6=15

3. 90 children lined up for the waterfountain. There were so many people. So they evenley split into 5 groups. 1 group stade and the other groups went to find another waterfountain. How many children are in each group?

CHANGES TO K-4 MATHEMATICS GOALS/LEARNING OUTCOMES

1995

CHANGES TO KINDERGARTEN MATHEMATICS GOALS/LEARNING OUTCOMES

Strand	1993 Curriculum Goals	1995 Changes
Patterns and Problem-Solving	**PPS1.** — Readiness for Patterning — ■ identifies attributes in presorted sets	— now an outcome in Grade 2
	PPS2. — Geometric and Number Patterns — ■ changes (translates) a concrete pattern to an action pattern	— now an outcome in Grade 2
	■ begins to recognize patterns in the environment	— now an outcome in Grade 1
	PPS3. — Uses calculators —	— now included in Number Concepts
	PPS4. — Problem Solving Strategies —	— now incorporated throughout all strands
Data Management	**DM1.** — Collects Data — ■ repeatedly experiences collecting data for the purpose of comparing 2 or 3 groups	— change to read: the student ■ collects, with assistance, first hand information (comparing is moved to grade 1)
	DM2. — Organizes and Displays Data — ■ graphs (group work) involving pictographs	— now an outcome in Grade 1
	DM3. — Interprets Data — ■ compares quantities	— change to read: the student ■ compares 2 categories
	■ answers oral questions	— now an outcome in Grade 1
	■ explains answers to questions	— now an outcome in Grade 1
Geometry	**G1.** — 3-D Solids and 2-D Shapes —	———
	G2. — Position and Spatial Relationships — ■ Position—children describe their own position and movements	— change to read: the student ■ describes the relative position of 3-D objects
	■ movements along a path	— now an outcome in Grade 3

CHANGES TO KINDERGARTEN MATHEMATICS (CONT'D)

Strand	1993 Curriculum Goals	1995 Changes
Measurement	**M1.** — Linear Measurement —	— add this outcome: the student ■ arranges objects in order of size, by length, and by height (presently in Grade 1)
	M2. — Perimeter —	———
	M3. — Area —	———
	M4. — Volume — ■ teacher models the language	— change to read: the student ■ uses the words full, empty, less, and more to talk about volume and capacity
	M5. — Mass/Weight —	— add this outcome: the student ■ uses the words heavier or lighter to talk about the mass/weight of two objects (presently in Grades 1&2)
	M6. — Time —	———
	M7. — Money —	———
	M8. — Temperature — (not part of the 1993 curriculum)	— add this outcome: the student ■ uses words like hot, hotter, cold, colder, warm, warmer, cool, cooler, to talk about temperature (not in present curriculum)

CHANGES TO KINDERGARTEN MATHEMATICS (CONT'D)

Strand	1993 Curriculum Goals	1995 Changes
Number Concepts	**NC1.** — Counting Sequences —	———
	NC2. — Number Meaning/Number Sense — ■ orders up to 3 sets of like objects according to number	— change to read: the student ■ builds, compares, and orders only 2 sets of like objects, based on the number of objects in each set, and describes the relationships between them using the terms more than, greater than, fewer than, less than, the same as and equal to (no written symbols) (presently in Grades 1 and 2)
	NC3. — Place Value Concepts —	— add this outcome: the student ■ explores the representation of single digit numerals using a calculator or computer to represent numerals on a screen (not in present curriculum)
	NC4. — Fractions —	———
	NC5. — Decimals —	———
Number Operations	**N01.** — Addition—	
	N02. — Subtraction — ■ initial experiences with · concrete materials · informal games · songs · chants · poems · stories	— change to read: the student ■ represents the processes of addition and subtraction through role-playing and the use of manipulative

CHANGES TO GRADE 1 MATHEMATICS GOALS/LEARNING OUTCOMES

Strand	1993 Curriculum Goals	1995 Changes
Patterns and Problem-Solving	**PPS1.** — Readiness for Patterning —	
	■ sorts/classifies/compares sets with 1 or 2 attributes	— change to read: the student ■ sorts objects, using only a single given or self-determined attribute (2 attributes now moved to Grade 2)
	■ identifies attributes in pre-sorted sets	— now an outcome in Grade 2
	PPS2. — Geometric and Number Patterns —	
	■ recognizes patterns	— change to read: the student ■ begins to recognize patterns in the environment (presently in Kindergarten).
	■ changes patterns · from action to concrete · from concrete to action · from action to pictorial · from pictorial to action	— now an outcome in Grade 3
	PPS3. — Calculators —	— now included in Number Concepts
	PPS4. — Problem-Solving Strategies —	— now incorporated throughout the Strands
	PPS5. — Applies Concepts and Operations —	— now moved to Number Operations Strand
Data Management	**DM1.** — Collects Data — ■ collects objects and pictures ■ collects personal responses to survey questions	— change to read: the student ■ collects, with guidance, first hand information, by · counting objects · conducting surveys · measuring · performing simple experiments
	DM2. — Organizes and Displays Data — ■ graphs (group or class activity) · real/concrete graph · picture graph · symbolic graph	— change to read: the student ■ constructs, with guidance, a concrete object graph and a pictograph, using 1 to 1 correspondence (symbolic/bar graphs now an outcome in Grade 2).

CHANGES TO GRADE 1 MATHEMATICS (CONT'D)

Strand	1993 Curriculum Goals	1995 Changes
Data Management (cont'd)	**DM3.** — Interprets Data — ■ labels data using numbers and words ■ describes the data in writing	— now an outcome in Grade 2
	DM4. — Probability —	———
Geometry	**G1.** — 3-D Solids and 2-D Shapes — ■ identifies and describes 3-D solids using characteristics such as · number of faces · number of edges · number of vertices · curved or straight edges · curved or flat faces	— now an outcome in Grade 2 — add these outcomes: the student ■ identifies, names, and describes specific 2-D shapes as · circles · triangles · rectangles (not in present curriculum) ■ compares, sorts, and classifies 2-D shapes (not in present curriculum)
	G2. — Position and Spatial Relationships —	— add these outcomes: the student ■ describes the relative position of 3-D objects and 2-D shapes, using such words as near, far, left, and right ■ matches size and shape of figures by superimposing one on top of the other ■ explores and describes reflections in a mirror (not in present curriculum)

CHANGES TO GRADE 1 MATHEMATICS (CONT'D)

Strand	1993 Curriculum Goals	1995 Changes
Measurement	**M1.** — Length —	———
	M2. — Perimeter—	———
	M3. — Area—	
	M4. — Capacity/Volume— ■ readiness activities through exploration and discussion	— change to read: the student ■ estimates, measures, records, and compares the volume/capacity of containers, using non-standard units (not in present curriculum)
	M5. — Mass/Weight — ■ estimates and compares the weight of two objects	— change to read: the student ■ estimates, measures, records, and compares the mass of objects, using non-standard units
	M6. — Time —	— add these outcomes: the student ■ estimates and measures the passage of time related to non-standard units (presently in Grade 2) ■ compares the duration of activities (not in present curriculum) ■ names and orders the days of the week and the seasons of the year (presently in Grade 2)
	M7. — Money —	———
	M8. — Temperature— (not in present curriculum)	— add this outcome: the student ■ describes and compares temperatures, using the senses (not in present curriculum)

CHANGES TO GRADE 1 MATHEMATICS (CONT'D)

Strand	1993 Curriculum Goals	1995 Changes
Number Concepts	**NC1.** — Counting Sequences — ■ rote counts forward to 50, using random starting points ■ oral skip counts by 2s to 20 5s to 50 10s to 100 ■ recognizes, builds, and orders sets to 20 ■ understands ordinals to 10	— change to read: the student ■ counts orally by 1s, 2s, 5s, and 10s to 100, and estimates, then counts the number of objects in a set (0 to 50), and compares the estimate with the actual number — now an outcome in Grade 2 (to 31)
	NC2. — Number Meaning/Number Sense — ■ recognizes, builds, and orders sets to 20	— change maximum number from 20 to 50
	NC3. — Place-Value Concepts — ■ uses manipulatives to represent numbers to 20 ■ reads and writes numerals to 20 as shown by manipulatives and diagrams	— change to read: the student ■ represents and describes numbers to 50 in a variety of ways, and explores the representation of numerals (0 to 50), using a calculator or a computer to display numerals
	NC4. — Fractions — ■ understands fractions (halves and fourths with any numerator)	— change to read: the student ■ demonstrates, and explains orally, an understanding of halves as part of a shape or solid
	NC5. — Decimals—	———
Number Operations	**NO1.** — Addition —	———
	NO2. — Subtraction— ■ explores and understands addition and subtraction to 10	—change the maximum numbers to 18 (no memorization intended) (presently in Grade 2)
	NO3. — Multiplication — ■ constructs equivalent sets concretely ■ introduce "X" symbol in both horizontal and vertical formats	—now an outcome in Grade 3 —now an outcome in Grade 3

CHANGES TO GRADE 2 MATHEMATICS GOALS/LEARNING OUTCOMES

Strand	1993 Curriculum Goals	1995 Changes
Patterns and Problem-Solving	**PPS1.** — Readiness for Patterning — ■ sorts/classifies/compares with 1 or more attributes	— change to read: the student ■ sorts objects and shapes, using one or two attributes (more than two is now an outcome in Grade 3)
	PPS2. — Geometric and Number Patterns — ■ recognizes, reproduces, continues, and supplies missing elements in patterns (and describes the rule of the pattern)	— "and describes the rule of the pattern" is now an outcome in Grade 3
	PPS3. — Uses Calculators —	———
	PPS4. — Problem-Solving Strategies —	— now incorporated throughout the Strands
	PPS5. — Applies Concepts and Operations —	— now moved to Number Operations Strand
Data Management	**DM1.** — Collects Data — * Survey questions should be formulated by the students	— change to read: the student ■ formulates the questions and categories for data collection, and chooses an appropriate recording method, such as tally marks, to collect data
	DM2. — Organizes and Displays Data — ■ organizes and displays collections independently	— change to read: the student ■ organizes data, using such graphic organizers as diagrams, charts and lists
	DM3. — Interprets Data — ■ obtains new information by performing some arithmetic operations on data	— now an outcome in Grade 3
	DM4. — Probability —	———

CHANGES TO GRADE 2 MATHEMATICS (CONT'D)

Strand	1993 Curriculum Goals	1995 Changes
Geometry	**G1.** — 3-D Solids and 2-D Shapes —	
	■ identifies and describes 3-D solids using characteristics (faces, edges, vertices, etc.)	— now an outcome in Grade 3. Change to read: the student ■ explores faces, vertices and edges of 3-D objects
	■ identifies and describes · rectangular solids	— change to read · pyramids
	■ observes and reproduces 3-D solids using · cubes · skeleton models	— change to read: the student ■ builds a skeleton of a 3-D object and describes how the skeleton relates to the object
		— add this outcome: the student ■ builds and rearranges a pattern, using a set of 2-D shapes
	■ identifies 3-D solids which are the same size and shape	— now an outcome in Grade 3
	■ identifies 2-D shapes that are the same size and shape (introduction to congruence)	— now an outcome in Grade 3
	G2. — Position and Spatial Relationships —	— change to read: the student ■ communicates and applies positional language in oral, written, or numerical form
	■ describes location of objects using positional language	
	■ draws and describes a path both orally and in writing	— now an outcome in Grade 3
		— add this outcome: the student ■ creates symmetrical 2-D shapes by folding and reflecting

CHANGES TO GRADE 2 MATHEMATICS (CONT'D)

Strand	1993 Curriculum Goals	1995 Changes
Measurement	**M1.** — Length —	— add this outcome: the student ■ selects the most appropriate standard unit (cm, dm, m) to measure a length (presently in Grade 3)
	M2. — Perimeter — ■ uses the words perimeter and circumference	— "perimeter" an outcome in Grade 3 and "circumference" now an outcome in Grade 4
	■ recognizes that different shapes may have the same perimeter	— now an outcome in Grade 5
	M3. — Area —	— add this outcome: the student ■ constructs a shape given a specific area in non-standard units
	M4. — Capacity/Volume—	———
	M5. — Mass/Weight —	— add this outcome: the student ■ recognizes that the size and shape of an object does not necessarily determine its mass/weight
	M6. — Time — ■ estimates and uses non-standard units to measure the passage of time	— change to read: the student ■ estimates and measures the passage of time related to minutes and hours
	■ reads and writes time to the · hour · half-hour	— now an outcome in Grade 3
		— add this outcome: the student ■ selects the most appropriate standard unit to measure a given period of time (presently in Grade 3)
	■ relates · 24 hours to 1 day · 12 months to 1 year	— add the following • days to a week • minutes to an hour and reads the date on a calendar
	M7. — Money —	———
	M8. — Temperature —	— add this outcome: the student ■ uses a thermometer to determine rising and falling temperatures (not in present curriculum)

CHANGES TO GRADE 2 MATHEMATICS (CONT'D)

Strand	1993 Curriculum Goals	1995 Changes
Number Concepts	**NC1.** — Counting Sequences — ■ rote counts 100 (forward/back) using random starting points (oral and written)	— change maximum from 100 to 1000
	■ skip counts using multiples as starting points (oral and written) · 2s to 100 · 5s to 100 · 10s to 100	— change maximum from 100 to 1000 — add this outcome: the student ■ counts by 25s to 100
	NC2. — Number Meaning/Number Sense —	———
	NC3. — Place Value Concepts —	———
	NC4. — Fractions — ■ understands fractions (halves, thirds, and fourths) with any numerator	— change to read: the student ■ illustrates and explains halves, thirds, and fourths as part of a region or set
	NC5. — Decimals —	———
Number Operations	**NO1.** — Addition —	
	NO2. — Subtraction — ■ begins to recall basic addition facts to 18 and subtraction facts to 10	— change to read: the student ■ recalls addition and subtraction facts to 10
	■ uses mental calculations (to solve addition and subtraction problems)	— change to read: the student ■ uses a variety of estimation and mental mathematics strategies to solve addition and subtraction problems
	NO3. — Multiplication —	———
	NO4. — Division — ■ understands and begins to recall multiplication facts to 25 (limit 5 x 5)	— now an outcome in Grade 3

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CHANGES TO GRADE 3 MATHEMATICS GOALS/LEARNING OUTCOMES

Strand	1993 Curriculum Goals	1995 Changes
Patterns and Problem-Solving	**PPS1.** — Readiness for Patterning —	———
	PPS2. — Geometric and Number Patterns —	— add this outcome: the student ■ uses objects and concrete models to explain the rule for patterns such as those found on addition and multiplication charts, and makes predictions based on addition and multiplication patterns (a summary of the present information for PPS2)
	PPS3. — Uses Calculators —	———
	PPS4. — Problem-Solving Strategies —	— now incorporated throughout the Strands
	PPS5. — Applies Concepts and Operations —	— now part of Number Operations Strand
Data Management	**DM1.** — Collects Data — ■ collects measurements, using standard units, to use as data	— change to read: the student ■ collects data, using measuring devices and printed/technology resources (presently in Grade 4)
	DM2. — Organizes and Displays Data —	———
	DM3. — Interprets Data —	———
	DM4. — Probability — ■ conducts experiments using · spinners · probability sack · die	— change to read: the student ■ conducts a probability experiment, chooses an appropriate recording method, and draws conclusions from the results

CHANGES TO GRADE 3 MATHEMATICS (CONT'D)

Strand	1993 Curriculum Goals	1995 Changes
Geometry	**G1.** — 3-D Solids and 2-D Shapes —	— change to read: the student ■ identifies and counts faces, vertices, and edges of 3-D objects (presently in Grade 2), compares and contrasts two 3-D objects, and identifies and names faces of a 3-D object with appropriate 2-D names
	■ identifies pyramids and prisms both in and outside the classroom	— change to read: the student ■ describes and names pyramids and prisms by the shape of their base (presently in Grade 4) — add these outcomes: the student ■ explores, concretely, the concepts of perpendicular, parallel, and intersecting lines on 3-D objects ■ recognizes congruent (identical) 3-D objects and 2-D shapes (presently in Grade 2)
	■ identifies right angles and angles larger or smaller than right angles	— now an outcome in Grade 4
	■ identifies and describes specific polygons having up to 8 sides	— now an outcome in Grade 5
	■ classifies polygons according to their characteristics	— now an outcome in Grade 4 (quadrilaterals) and in Grade 5 (triangles)
	G2. — Position and Spatial Relationships — ■ describes the locations of objects using specific directions	— add this phrase: ■ ... and relates directions to maps (presently in Grade 4) — add these outcomes: the student ■ graphs whole number points on a horizontal and vertical number line (not in present curriculum) ■ traces a path, using oral and written instructions (presently in Grades 2 and 3)

CHANGES TO GRADE 3 MATHEMATICS (CONT'D)

Strand	1993 Curriculum Goals	1995 Changes
Measurement	**M1.** — Length —	
	■ relates 10 centimetres to 1 decimetre, and 10 decimetres to 1 metre	— change to read: the student ■ describes the relationships among cm, dm and m
	M2. — Perimeter —	— add this outcome: the student ■ estimates, measures, records, compares, and orders objects by...perimeter, using standard units (presently in Grade 2)
	■ recognizes that the same shape (area) may have different perimeters	— now an outcome in Grade 5
	M3. — Area —	— add these outcomes: the student ■ selects an appropriate non-standard unit to measure area, (not in present curriculum) ■ estimates, measures, records, compares, and orders shapes using non-standard units, and constructs a variety of shapes given a specific area in non-standard units
	■ estimates, compares, records, and orders area by counting the number of square decimetres needed to cover a surface	— now an outcome in Grade 4
	M4. — Capacity/Volume —	———
	M5. — Mass/Weight —	———
	M6. — Time —	— add this outcome: the student ■ reads and writes days of the week and months of the year
	■ selects appropriate unit for measuring (the passage of) time—seconds, minutes, days, months, years	— add these units · hours · weeks
	M7. — Money —	— add these bills
	■ identifies 2, 5, 10, and 20 dollar bills	· $50 · $100
	M8. — Temperature —	— add this outcome: the student ■ estimates, reads, and records temperature to the nearest degree C, and relates temperature to everyday situations (not in present curriculum)

CHANGES TO GRADE 3 MATHEMATICS (CONT'D)

Strand	1993 Curriculum Goals	1995 Changes
Number Concepts	**NC1.** — Counting Sequences —	— add this outcome: the student ■ skip counts backward by 2s, 5s, 10s, and 100's using respective multiples as starting points
	■ relates skip counting to .... multiplication	— now an outcome in Grade 4
	NC2. — Number Meaning/Number Sense — ■ identifies odd and even numbers to 1000	— change to read: the student ■ recognizes and explains if a number is divisible by 2, 5, or 10
	NC3. — Place Value Concepts —	———
	NC4. — Fractions — ■ extend to fifths and tenths	— change to read: the student ■ illustrates and explains fifths and tenths as part of a region or a set
	NC5. — Decimals —	———
Number Operations	**NO1.** — Addition —	
	NO2. — Subtraction — ■ understands, creates, and solves addition problems to 1000 and subtraction problems to 100	— change so both maximums read ... to 1000
	■ uses and discusses various strategies (for finding addition and subtraction solutions)	— change to read: the student ■ justifies the choice of method for addition and subtraction, using · estimation strategies · mental mathematics strategies · manipulatives · algorithms · calculators
	■ uses mental calculations	— change to read: the student ■ verifies solutions to addition and subtraction problems, using · estimation · calculators · inverse operations
	NO3. — Multiplication —	
	NO4. — Division — ■ understands and solves multiplication questions to 100, and division questions to 50	— add this outcome: the student ■ calculates products and quotients (for problems involving numbers beyond 50), using estimation strategies and mental mathematics strategies

CHANGES TO GRADE 4 MATHEMATICS GOALS/LEARNING OUTCOMES

Strand	1993 Curriculum Goals	1995 Changes
Patterns and Problem-Solving	**PPS1.** — Readiness for Patterning —	— add these outcomes: the student ■ sorts numbers into categories, using one or more attributes ■ identifies and explains mathematical relationships and patterns, using · Venn/Carroll/tree diagrams
	PPS2. — Number Meanings/ Number Patterns —	— add these outcomes: the student ■ identifies and explains mathematical relationships and patterns, using · objects/models · grids/tables · Venn/Carroll/tree diagrams · graphs · technology ■ makes and justifies predictions, using numerical and non-numerical patterns
	PPS3. — Uses Calculators —	———
	PPS4. — Problem-Solving Strategies—	— now incorporated throughout the strands
	PPS5. — Applies Concepts and Operations—	— now part of Number Operations
Data Management	**DM1.** — Collects Data — ■ conducts surveys using sample populations	— change to read: the student ■ selects a sample or population, and organizes the collection of data
	DM2. — Organizes and Displays Data —	— add this outcome: the student ■ discusses the process by which the data were collected
	DM3. — Interprets Data —	———
	DM4. — Probability —	— add this outcome: the student ■ compares outcomes as equally likely, more likely, less likely
	■ conducts experiments to answer own questions	— change to read: the student ■ designs and conducts experiments to answer one's own questions

CHANGES TO GRADE 4 MATHEMATICS (CONT'D)

Strand	1993 Curriculum Goals	1995 Changes
Geometry	**G1.** — 3-D Solids and 2-D Shapes —	
	■ identifies and describes the characteristics of pyramids and prisms	— change to read: the student ■ compares and contrasts · pyramids · prisms · pyramids and prisms
	■ identifies and names specific prisms and pyramids by the shape of the base	— now an outcome in Grade 3
	■ search for a relationship between the number of faces, vertices, and edges	— now an outcome in Middle years
	■ explores, through construction, the concept of oblique pyramids and prisms	— now an outcome in Middle Years
		— add these outcomes: the student ■ identifies and sorts specific quadrilaterals, including squares, rectangles, and parallelograms ■ recognizes, from everyday experience, and identifies · point · line · angle · parallel lines · perpendicular lines · vertical lines · horizontal lines (not in present curriculum) ■ describes angles in a variety of orientations according to whether they are right, significantly less than right, or significantly greater than right
	G2. — Position and Spatial Relationship —	
	■ reads simple map - explores simple map-making using directions	— add to this outcome ■ ...and grids, and places an object on a grid, using rows and columns (not presently in curriculum) — add this outcome: the student ■ traces a path, using oral or written instructions, and writes instructions for a given path (presently in Grade 2) ■ creates and verifies symmetrical 2-D shapes by drawing lines of symmetry

CHANGES TO GRADE 4 MATHEMATICS (CONT'D)

Strand	1993 Curriculum Goals	1995 Changes
Measurement	**M1.** — Length —	— add this outcome: the student ■ constructs items of specific lengths, including mm, and relates the size of the unit to the number of units used to measure area (not in present curriculum)
	M2. — Perimeter — ■ recognizes that shapes with the same areas may have different perimeters, and vice versa	— now an outcome in Grade 5
	M3. — Area —	— add this outcome: the student ■ constructs a number of shapes, given a specific area (cm^2) (presently in Middle Years)
	M4. — Capacity/Volume—	— add this outcome: the student ■ relates the size of unit to the number of units needed to measure capacity/volume
	■ constructs dm^3 and m^3	— an outcome in Middle Years
	M5. — Mass/Weight —	— add this outcome: the student ■ relates the size of unit to the number of units needed to measure mass/weight
	M6. — Time — ■ writes days of the week and months of the year	— now an outcome in Grade 3
	■ reads and writes time, using digital and analog clocks: · to the quarter hour · minutes past the hour · minutes to the hour	— change to read: the student ■ reads an analog clock to the nearest 5 minutes, and writes time using am and pm
	■ relates · 30 minutes to 1/2 hour · 15 minutes to 1/4 hour · leap year	— add these relationships · years to decades · decades to centuries · centuries to millenniums
	■ recognizes time using 24 hour clock	— now an outcome in Middle Years
	■ uses metric notation for time	— now an outcome in Middle Years
	M7. — Money — ■ extend to $50 and $100 bills	— now an outcome in Grade 3
	M8. — Temperature —	— not in present curriculum

CHANGES TO GRADE 4 MATHEMATICS (CONT'D)

Strand	1993 Curriculum Goals	1995 Changes
Number Concepts	**NC1.** — Counting Sequences —	— add this outcome: the student ■ uses skip counting (forward and backward) to support an understanding of multiplication and division
	NC2. — Number Meanings/Number Sense— ■ estimates the number of objects (0-9999) ■ uses ordinals to 9999 ■ demonstrates prime and composite numbers to 100, using manipulatives, diagrams, and a calculator	— change the maximum to read ...(0 to 1000) — change to read: the student ■ uses ordinals to 1000 — now an outcome in Grade 5
	NC3. — Place Value Concepts —	———
	NC4. — Fractions — ■ extend to hundredths	— change to read: the student ■ illustrates and explains hundredths as part of a region and a set, and connects proper fractions to decimals (tenths and hundredths) using manipulatives, diagrams, and symbols
	NC5. — Decimals —	———
Number Operations	**NO1.** — Addition —	———
	NO2. — Subtraction —	— add this outcome: the student ■ demonstrates an understanding of addition and subtraction of decimals (tenths and hundredths) using concrete and pictorial representations
	NO3. — Multiplication —	———
	NO4. — Division — ■ understands and solves multiplication questions involving a 2-digit by a 1-digit number	— change to read: ...3 digit by 1 digit numbers — add this outcome: the student ■ justifies the method used to calculate products and quotients, choosing from estimation strategies, mental mathematics strategies, manipulatives, algorithms, and calculator, and uses estimation, inverse operations, or calculators to verify solutions for problems involving multiplication and division

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